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
- 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
I was feeling overwhelmed and afraid that I lacked what it takes to successfully homeschool my kids,” writes Jennifer A of Battle Creek, MI. “I contacted an Advisor on Sonlight’s online chat tool and got the help I needed. The next day I was able to put her counsel into practice!”
Science (5-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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Sonlight Curriculum® “Intro to the World: Cultures” (5-Day) Instructor’s Guide and Notes, Twenty-Ninth 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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8042 South Grant Way
Littleton, CO 80122-2705
USA
Phone (303) 730-6292 Fax (303) 795-8668
E-mail: main@sonlight.com

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SCIENCE Instructor’s Guides

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.

Try before you buy!
Get a three week sample of any Sonlight Instructor’s Guide—FREE!
sonlight.com/samples
Instructor’s Guides A-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.

---

**Science: 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
   - When it is summer in:
   - South America
   - When it is winter 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
Welcome!

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.

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. 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 cannot be taught simply by reading books; they have to be modeled.

One quick note before you begin: The experiments also 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.

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 to 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 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

After the notes for each week, you will find Activity Sheets to reinforce what you are teaching and engage your student. 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, 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 Few Other Helpful Hints

Write or color first, then cut out. Small pieces of paper are hard to work with, even if your children have fully developed fine motor skills. Eliminate some frustration for your children (and mess for you!) by cutting out pieces last.
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

For your convenience, we have created a website that is dedicated to providing you with links that we think are helpful for supplementing the material your children will be learning. That website is http://www.sonlight.com/iglinks.html. Every time we have provided a corresponding link on this page, you will see this symbol: ☞ 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 you would 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.html. 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.

Summary

We hope these instructions help you. If we can be of any further assistance, please don’t hesitate to write or call or, better yet, visit us at forums.sonlight.com ☞. We would love to be of service. I would especially like to encourage you to visit the Sonlight® Forums. There you can converse with other homeschoolers, seek advice, offer your insights, and join our community. If you are looking for help and encouragement, our forums are just for YOU! ☛
<table>
<thead>
<tr>
<th>ESK (Science Supplies Kit) Item</th>
<th>Week(s) Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>aluminum foil</td>
<td>1, 5, 14, 15, 16, 18, 21, 23, 24, 25, 35</td>
</tr>
<tr>
<td>balloon</td>
<td>34</td>
</tr>
<tr>
<td>bar magnet (optional)</td>
<td>14</td>
</tr>
<tr>
<td>bare copper wire</td>
<td>14, 16</td>
</tr>
<tr>
<td>black construction paper</td>
<td>13, 14, 15, 16</td>
</tr>
<tr>
<td>clay (plasticine, model dough, etc.)</td>
<td>6, 11, 13, 14, 15, 16, 24, 25, 33, 35</td>
</tr>
<tr>
<td>clothespins</td>
<td>11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25</td>
</tr>
<tr>
<td>D-cell battery</td>
<td>18, 19, 20, 21, 22, 23, 24, 25, 36</td>
</tr>
<tr>
<td>flashlights</td>
<td>5, 9, 12, 17, 23, 30, 31, 33</td>
</tr>
<tr>
<td>insulated wire</td>
<td>11, 15, 16</td>
</tr>
<tr>
<td>iron filing</td>
<td>10, 14</td>
</tr>
<tr>
<td>magnets</td>
<td>1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16, 17</td>
</tr>
<tr>
<td>nail, steel 2¾&quot;</td>
<td>2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 16, 17, 18, 20, 21, 23, 24, 25, 30, 33, 34, 35</td>
</tr>
<tr>
<td>paper clips</td>
<td>10, 11, 15, 22, 23</td>
</tr>
<tr>
<td>plastic cups</td>
<td>1, 2, 5, 6, 7, 14, 15, 20, 22, 23, 24, 25</td>
</tr>
<tr>
<td>plastic cups</td>
<td>5, 6, 8</td>
</tr>
<tr>
<td>rubber bands</td>
<td>16, 22, 23, 24</td>
</tr>
<tr>
<td>steel wool</td>
<td>10, 22, 30, 31, 33, 34</td>
</tr>
<tr>
<td>straight pins</td>
<td>1, 3, 5, 6, 8, 10, 12, 14, 15, 31</td>
</tr>
<tr>
<td>straws</td>
<td>30</td>
</tr>
<tr>
<td>styrofoam cups</td>
<td>3, 14</td>
</tr>
<tr>
<td>toothpicks</td>
<td>22</td>
</tr>
<tr>
<td>washers</td>
<td>1, 10, 11, 14, 22</td>
</tr>
</tbody>
</table>
### Parental Notes

- Science E
  - Days 1–5: **Date:** _______ to _______

<table>
<thead>
<tr>
<th>Week 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date:</strong></td>
<td><strong>Day 1</strong></td>
</tr>
<tr>
<td><strong>Science Encyclopedia</strong></td>
<td>pp. 3–5</td>
</tr>
<tr>
<td><strong>Activity Sheet Questions</strong></td>
<td>1–3</td>
</tr>
<tr>
<td><strong>TOPS #33: Magnetism</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Discover &amp; Do Level 4 DVD</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supplies</th>
<th>We provide: ESK—aluminum foil, straight pins, paper clips, washers, magnets. <strong>You provide:</strong> thread, copper pennies.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shopping/Planning List</strong></td>
<td>For next week: scissors, thread, pencil.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Subjects:</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

**The Usborne Science Encyclopedia**

<table>
<thead>
<tr>
<th>Day</th>
<th>pp. 3–5</th>
</tr>
</thead>
</table>

The guide to the book notes “simple experiments” on some pages of the text. Feel free to consider these experiments as optional, as you and your children will have plenty of scheduled experimenting to do with other books in this level. [p. 3]

The book is somewhat speculative about how early people may or may not have viewed counting and numbers. Some of the greatest mathematical thinkers lived in ancient times, so the idea that people of the past didn’t have much of a clue regarding math, counting, and numbers is something of a stretch. An astute understanding of certain areas of mathematics was necessary in building ancient structures such as the pyramids of Egypt, for example. [p. 4]

Note that the book uses British spellings such as “metre” (meter) and “litre” (liter). “Cubits” are mentioned throughout the Bible.

The book notes, correctly, that most countries today use the metric system. The United States, however, still uses inches, feet, and yards for much measuring. The exception is in the field of science, where the metric system is dominant. [pp. 6–7]

Did you know that clocks were originally used by monks to better schedule their times of worship? It wasn’t until later that clocks began to be used for things other than Christian worship. Now clocks are found almost everywhere. We have schedules, time zones, wrist watches, and precise times when things are supposed to start and finish. What’s good about having so many clocks and schedules? Are there any negative aspects to the detailed keeping of time? Look at the map on page 9 and ask your children if they can find their time zone. [pp. 8–9]
Read the text at the top of both pages before looking at the illustration below. The text defines key terms you will see in the picture such as kinetic and potential energy. [pp. 10–11]

The book correctly states that our “energy comes from the food” we eat. But where did all this energy come from to begin with? What keeps the energy in the universe going? Biblically, we are told that Christ sustains “all things” (see Hebrews 1:3, for instance). [pp. 12–13]

Activity Sheet Questions

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 the question.

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. If you like, color the sheets first, then cut them out and attach them to the worksheet.

Discover & Do Level 4 DVD

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, Light & Color, 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 in Motion” section on the disc. You and your children are welcome to view the unscheduled tracks (#59–65) for fun, but consider them optional.

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

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. When supplies are listed as Light & Color, they are materials that are included with your Light & Color book.
1. Write your age, your father’s age and your grandfather’s age in Roman and Arabic numerals. (pp. 4–5)

<table>
<thead>
<tr>
<th>Roman numerals:</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabic numerals:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>50</td>
</tr>
</tbody>
</table>

My age: Arabic: _____ Roman: ______
My father’s age: Arabic: ______ Roman: ______
My grandfather’s age: Arabic: ______ Roman: ______

2. What are some of the advantages of the Arabic system? Check all that are true. (pp. 4–5)
   - Arabic is shorter and simpler to write.
   - Arabic simplifies things so you don’t have to add/subtract symbol to symbol to figure out a number.
   - Arabic has a value for zero.
   - Arabic only adds ones, tens and hundreds.

3. **Challenge!** What does the prefix “bi” mean? (pp. 4–5)

   How many symbols are used in a binary system? ______

   a. Computers use the symbols ______ and ______ (pp. 4–5)
   b. What base system do clocks use? ______ (pp. 4–5)

4. When you compare something to a fixed quantity, that quantity is called a unit of ______ (pp. 6–7)

5. Why are units of measure that are based on the human body difficult to use? (p. 7)

6. Why is the metric system better as a standard measurement system? (p. 7)

7. **Talk it out** question: Demonstrate/explain out loud to Mom or Dad.

   Based on the time zones, explain why people on the other side of the world are already in tomorrow (or are still in yesterday). (Lines provided for dictation) (pp. 8–9)

8. Why does a leap year only come every so often? (pp. 8–9)

9. Name at least five types (or forms) of energy. (p. 10–11)

   - (potential)
   - (light)
   - (chemical)
   - (kinetic)
   - (sound)

   (Answers will vary. Possible: toaster—electrical energy into heat energy.)

10. Write one example of a change in energy. (Example: a boom box changes electrical energy into sound energy.) (pp. 12–13)
11. Use the words in the box to complete the crossword puzzle. We have removed any spaces between words. (pp. 4-11)

Across
1) first system of measurement not based on the body
4) a written symbol to stand for an amount
6) measurement system based on English king's body
8) a counting system formed around this quantity

Down
J O U L E

M E T R I C S Y S T E M

I M

N U M E R A L

A T

I M P E R I A L U N I T S

S B

A S I S

- numeral - imperial units - volume - base - time zones - metric system - joule - axis

1) ____________________________ 2) ____________________________ 3) ____________________________

13. Why can you pick up a pot with a plastic handle and not get burned? (p. 14)
________________________________________________________________________________________________
________________________________________________________________________________________________

14. Why does smoke rise? (p. 17)
☐ because it is lighter than air
☐ because it is hot and hot things rise
☐ because the wind catches it
☐ because heat energy moves through air by convection and the moving air carries the smoke particles in the direction heat moves
The Usborne Science Encyclopedia

1. Write your age, your father’s age and your grandfather’s age in Roman and Arabic numerals. (pp. 4–5)

   Roman numerals: I II III IV V VI VII VIII IX X L
   Arabic numerals: 1 2 3 4 5 6 7 8 9 10 50

   My age: Arabic: _______ My father’s age: Arabic: _______ My grandfather’s age: Arabic: _______
   Roman: _______ Roman: _______ Roman: _______

2. What are some of the advantages of the Arabic system. Check all that are true. (pp. 4–5)

   ☐ Arabic is shorter and simpler to write.
   ☐ Arabic simplifies things so you don’t have to add/subtract symbols together to figure out a number.
   ☐ Arabic has a value for zero.
   ☐ Arabic only adds ones and tens and hundreds.

3. a. Challenge! What does the prefix “bi” mean? ________________________________ (pp. 4–5)
   How many symbols are used in a binary system? ________________________________
   b. Computers use the symbols ___________ and ___________. (pp. 4–5)
   c. What base system do clocks use? ________________________________ (pp. 4–5)

4. When you compare something to a fixed quantity, that quantity is called a unit of _______________. (pp. 6–7)
   measure movement inches ruler

5. Why are units of measure that are based on the human body difficult to use? (p. 7)
   ___________________________________________________
   ___________________________________________________

6. Why is the metric system better as a standard measurement system? (p. 7)
   ___________________________________________________
   ___________________________________________________
   ___________________________________________________
7. Talk it out question: Demonstrate/explain out loud to Mom or Dad.

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8. Why does a leap year only come every so often? (pp. 8–9)

____________________________________________________________________________
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9. Name at least five types (or forms) of energy. (p. 10–11)

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
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____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
11. Use the words in the box to complete the crossword puzzle. We have removed any spaces between words. (pp. 4–11)

Across
1) first system of measurement not based on the body  
4) a written symbol to stand for an amount  
6) measurement system based on English king’s body  
8) a counting system is formed around this quantity

Down
2) the world is divided into 24 of these  
3) unit of measurement for energy  
5) an imaginary line that the Earth spins on  
7) the amount of space an object fills


1) ____________________________  2) ____________________________  3) ____________________________

13. Why can you pick up a pot with a plastic handle and not get burned? (p. 14)

________________________________________________________________________________________

14. Why does smoke rise? (p. 17)

- because it is lighter than air
- because it is hot and hot things rise
- because the wind catches it
- because heat energy moves through air by convection and the moving air carries the smoke particles in the direction heat moves
Usborne Science Encyclopedia

**Day 7** pp. 22–25

The reference to the Earth being “formed about 4,500 million years ago” is equivalent to 4.5 billion years ago. On issues regarding the age of the earth and the universe, as well as phrases such as “millions of years” or “billions of years,” see our note in the Introduction.

The book presents an oversimplification of what scientists can learn from the fossil record. The “picture” scientists come up with based on studying the fossil record has resulted in very different perspectives. It should also be noted that the fossil record is incomplete. Whereas Darwin anticipated the finding of many fossils to serve as missing links in his theory, the reality is that in many cases complex life forms appear in the fossil record fully formed.

Here and elsewhere (p. 49) the book identifies Pluto as a planet, but the International Astronomical Union now considers it a plutoid or dwarf planet.

Studies of astronomy sometimes come across as minimizing the value of our world. After all, we are merely one planet in one solar system in one galaxy in a vast universe. But God cares about every aspect of His creation, as well as every person.

The technical term for the description of Earth’s plates and how they work is known as *plate tectonics*. [p. 22–23]

On references to “millions” of years ago on this page, see our note in the Introduction.

The book makes a wildly speculative guess when it states about oil, “There may only be enough to last for another 60 years.” The true answer to the question, “How long will Earth’s oil supply last?” depends on several factors. We don’t have an accurate assessment of how much oil is left in the world. This means that our oil reserve estimates are just that—estimates. It’s also possible that we’ll find new oil deposits that haven’t been discovered yet. The question about how many years of oil we have left also depends on how much oil is used now and how much might be used in the future and at what rate (no one has exact answers to any of these questions). Since there are other sources of energy, it’s also possible our usage and dependence on oil may decrease in the future rather than increase.
You see, science sometimes involves a lot of educated guessing! One thing is certain and that is that there is indeed a limited supply of oil in the world, we just don’t know how much. This means we should be good stewards of the resources God has given us, rather than being wasteful or careless with what we have. [p. 24]

The book lists the longest oil pipeline as being in North America. That is no longer the case. As of this printing the longest oil pipeline is 2,500 miles long. It is called the Druzhba pipeline and transports Russian oil. [p. 25]

The book also lists that there are currently 46 moons in the solar system. As of this printing, many more moons have been discovered. [p. 23]

This next section is really about physics. That’s why you’ll read about things like force, motion, tension, reaction, gravity, action, reaction, and more. Physics is all about the science of energy, force, matter, and motion.

The book mentions measuring forces using “units called newtons,” but fails to mention the connection to scientist Isaac Newton (1643–1727). A Christian as well as a man of science, Newton produced important work on the subject of gravity and the laws of motion.
6. Is this a food chain or a food web? (p. 21)  

food chain  

food web  

7. What is transferred from one creature to the next in either a food chain or a food web? (pp. 20-21)  

food  

cells  

water  

energy  

8. What are the four main gases in the atmosphere? (Fill in the rest of the word.) (pp. 22–23)  

n __ __ __ __ __  

o __ __ __ __ __  

a __ __ __ __  

c __ __ __ __ __ __  

9. The atmosphere's purpose is _______________________________.  

During the day it _________________________ the earth from the burning heat of the Sun. At night it acts like a blanket keeping in heat. (pp. 22–23)  

insulation  

(protects)  

The Usborne Science Encyclopedia  

1. Give a mini-speech to someone explaining how conduction, convection, and radiation work.  

(Answers will vary. Possible: Heat moves through solids by conduction. Heat travels through a room through convection, as the heated air moves. Heat moving in invisible straight lines without the aid of particles to carry it is called radiation)
10. Use the words in the box to complete the following. Fill in the blanks with the correct answers. (pp. 22–23)

plates  
lea  
solar system  
continental shelf  
mantle  
atmosphere  
magma  
fauls  
Milky Way  
continental drift

a. The _________ (solar system) _________ is the group of planets and their moons (plus other debris) that circle the Sun.
b. _________ (magma) _________ is the hot, liquid rock under the crust.
c. _________ (heat) _________ is hot, liquid rock that breaks through the crust.
d. _________ (plates) _________ are pieces of the Earth's crust that float on hot magma.
e. The crust floats on the _________ (mantle) _________, which is made up of magma.
f. The shallow part of the ocean near land is the _________ (continental shelf) _________.
g. The thick layer of air that is a combination of gases that surrounds the earth is the _________ (atmosphere) _________.
h. The movement of the continents on the Earth's surface is _________ (continental drift) _________.
i. _________ (faults) _________ are cracks in the Earth's crust.
j. The name of our galaxy is _________ (Milky Way) _________.

11. Why do people look for energy other than fossil fuels? List two reasons. (pp. 24–25)
1) _____________________________________
2) _____________________________________

12. List five alternative energy sources. (pp. 26–27)
1) ____________
2) ____________
3) ____________
4) ____________
5) ____________

13. Talk it out question: Demonstrate or plan out loud to Mom or Dad.
Describe how flowing water is changed into energy. (Lines provided for dictation) (pp. 26–27)

14. List four types of force. (pp. 28–29)
1) _________________________
2) _________________________
3) _________________________
4) _________________________

15. What does "forces come in pairs" mean? (pp. 28–29)
(For every action there is an equal and opposite reaction.)

16. Write the letter of the definition in the blank next to the word it defines for the following questions. (pp. 24–29)

A) a push or pull  
B) can be harnessed through the use of windmills to produce electricity
C) to increase in speed  
D) energy released when uranium atoms are split
E) heat and light energy from the sun  
F) heat energy from the earth
G) kinetic energy in the ocean's tides is captured by turbines to produce electricity
H) kinetic energy in water flowing downhill
I) made from plant and animal matter, coal, oil, gas
J) the unit of measure for forces
Science E: Week 2 Activity Sheet

The Usborne Science Encyclopedia

1. Give a mini-speech to someone explaining how conduction, convection, and radiation work.
   (Lines provided for dictation.) (pp. 14–18)

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. An __________________________ is a poor conductor of heat.
   A __________________________ allows heat to travel quickly. (pp. 14–18)

3. Use the words in the box to complete the sentences. (p. 21)
   photosynthesis chlorophyll respiration

   a. The green chemical that helps plants use sunlight to make food is called __________________________.

   b. The process of changing food into energy is __________________________.

   c. The process by which plants make their own food is called __________________________.

4. What seven things does the body need from food? (Fill in the missing letters.) (pp. 20–21)

   1) w __ __ __  
   2) v __ __ a __ i __ __  
   3) __ r __ __ __ n __
   4) __ i __ __ __ __ s  
   5) __ __ __ g h __ __ __
   6) c a __ __ h __ __ __ t __ __
   7) __ a __ __

5. Is this a food chain or a food web? (Circle one.) (pp. 20–21)
   food chain food web

   [Diagram of a food chain: Fox → Rabbit → Lettuce]
6. Is this a food chain or a food web? (p. 21) 

food chain  food web

7. What is transferred from one creature to the next in either a food chain or a food web? (pp. 20-21) 

<table>
<thead>
<tr>
<th>food</th>
<th>cells</th>
<th>water</th>
<th>energy</th>
</tr>
</thead>
</table>

8. What are the four main gases in the atmosphere? (Fill in the rest of the word.) (pp. 22–23) 

n ____ ____ ____ ____  o ____ ____ ____

a ____ ____ ____ ____  c ____ ____ ____ d ____ ____ ____

9. The atmosphere’s purpose is __________________________.

During the day it __________________________ the earth from the burning heat of the Sun.

At night it acts like a blanket keeping in heat. (pp. 22–23)
10. Use the words in the box to complete the following. Fill in the blanks with the correct answers. (pp. 22–23)

<table>
<thead>
<tr>
<th>plates</th>
<th>lava</th>
<th>solar system</th>
<th>continental shelf</th>
<th>mantle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>atmosphere</td>
<td>magma</td>
<td>faults</td>
<td>Milky Way</td>
<td>continental drift</td>
</tr>
</tbody>
</table>

a. The __________________________ is the group of planets and their moons (plus other debris) that circle the Sun.
b. __________________________ is the hot, liquid rock under the crust.
c. __________________________ is hot, liquid rock that breaks through the crust.
d. __________________________ are pieces of the Earth's crust that float on hot magma.
e. The crust floats on the __________________________ , which is made up of magma.
f. The shallow part of the ocean near land is the __________________________ .
g. The thick layer of air that is a combination of gases that surrounds the earth is the __________________________ .
h. The movement of the continents on the Earth's surface is __________________________ .
i. __________________________ are cracks in the Earth's crust.
j. The name of our galaxy is __________________________ .

11. Why do people look for energy other than fossil fuels? List two reasons. (pp. 24–25)

1) ___________________________________________________________________________________________
2) ___________________________________________________________________________________________

12. List five alternative energy sources. (pp. 26–27)

1) ___________________________________________________________________________________________
2) ___________________________________________________________________________________________
3) ___________________________________________________________________________________________
4) ___________________________________________________________________________________________
5) ___________________________________________________________________________________________
Science E: Week 2 Activity Sheet

13. Talk it out question: Demonstrate/explain out loud to Mom or Dad.

Describe how flowing water is changed into energy. (Lines provided for dictation) (pp. 26–27)

_________________________________________________
_________________________________________________
_________________________________________________
_________________________________________________
_________________________________________________

14. List four types of force. (pp. 28–29)

1) ___________________________ 2) ___________________________

3) ___________________________ 4) ___________________________

15. What does “forces come in pairs” mean? (pp. 28–29)

________________________________________________________________________________________________

16. Write the letter of the definition in the blank next to the word it defines for the following questions. (pp. 24–29)

| ______ fossil fuels | A) a push or pull |
| ______ nuclear energy | B) can be harnessed through the use of windmills to produce electricity |
| ______ hydroelectric power | C) to increase in speed |
| ______ tidal energy | D) energy released when uranium atoms are split |
| ______ wind energy | E) heat and light energy from the sun |
| ______ solar energy | F) heat energy from the earth |
| ______ geothermal energy | G) kinetic energy in the ocean's tides is captured by turbines to produce electricity |
| ______ force | H) kinetic energy in water flowing downhill |
| ______ accelerate | I) made from plant and animal matter; coal, oil, gas |
| ______ newton | J) the unit of measure for forces |
Week 3

Usborne Science Encyclopedia

Day 11  pp. 30–31

Does the word “tyres” look strange to you? It might if you live in the United States, where the word is spelled “tires,” but in the U.K., where Usborne books is located, “tyres” is perfectly acceptable. But no, it doesn’t have anything to do with the ancient Phoenician seaport of Tyre, mentioned several times in the Bible and known today as Sur, Lebanon. And “Lorry” means trucks. [p. 30]

Day 12  pp. 32–33

In some ways, scientists still consider gravity a mystery. There are some theories as to how it works, but what it is still baffles us. One theory suggests that the universe is stretched out sort of like a rubbery sheet. Planets and stars on this “sheet” weigh down their area of the universe, creating a sort of gravity well that causes things to pull down, thus resulting in gravity.

While we need to be careful that we don’t always turn to God to fill in gaps in our understanding of how things work, biblically speaking it is Christ who holds all things together (see Colossians 1:15–17), even gravity.

For a fun book about gravity see Gravity Is a Mystery by Franklyn M. Branley (Collins, 2007).
Do Together

Day 11  Science Friction

Time to head to the playground! Find a play place with a big metal slide, if at all possible. Take along a few items to test out the scientific concept of friction, such as toys with wheels, wooden blocks, rocks, etc.

Remind your children that friction is a force that stops motion. Without friction, anything that starts moving in one direction would never stop! Bring along a watch (a stopwatch is even better, if you have one) and some waxed paper and water to make your testing more fun.

Ask your children which items they think will go down the slide the fastest. Test each item one at a time. Using a watch or stopwatch, time each item to see how long it takes to travel the length of the slide. What do your children notice? What items move fastest? Why? What qualities do these items have that make them move faster?

For fun, test the objects with waxed paper and/or water (your children can either rub the bottom of the items with waxed paper or set them on the paper). Does the waxed paper make a difference in the time it takes for the items to reach the bottom of the slide? Wet the slide and see what effect water has. Will the items move faster or slower? Does the amount of water matter?

If you’re brave, let your children test themselves. How fast can they go down the slide dressed as they are? What if they sit on waxed paper? What if they go down a wet slide? Use this fun activity to reinforce what your children have learned about the concept of friction and how it can be manipulated.

Day 13  Falling Down

Have your children ever wondered why they always fall … down? Have they ever fallen … up? Why not? Can they think of anything they could push off of a table that would rise to the sky instead of falling to the ground?

Discuss what your children learned this week about gravity. What are the benefits of gravity? Do your children see any drawbacks to gravity or wish it worked differently in any way?

If you want to have a silly and fun time experimenting with gravity, send the kids outside to collect some stones. Then take them to a nearby bridge and just have some fun throwing stones in the water. Let them test different size stones. Do they fall at the same rate? Which falls faster? A stone or a feather? Why? Enjoy your time together, putting feet to the lessons they’ve learned this week.
Science E: Week 3 Activity Sheet

1. The force _______ stops things from moving or slows them down when they are moving. (pp. 30–31)

2. Talk it out question: Demonstrate explain out loud to Mom or Dad.
When is friction helpful? (Lines provided for dictation) (pp. 30–31)
(Answers will vary. Possible answers: causes bicycle brakes to stop the bike; helps tires grip on smooth roads; helps mountain climbers (hearing? the rocks make hands work harder.))

3. How is air resistance related to friction? (pp. 30–31)
(a) Air resistance is the friction between anything moving and the air around it. 
(b) Air resistance is the tendency to keep moving.

4. List two things you could do to reduce friction. (pp. 30–31)
1) _______ 2) _______

5. What is the point where a thing's weight balances called? (p. 32)
________________________

6. Which has more air resistance, a flat piece of paper or a similar sheet crumpled into a ball? (Circle the correct answer) (p. 33)
(a) Flat paper has more air resistance. It has more surface area to block the wind.

7. What does gravity do? Put an X by all that apply. (pp. 32–33)
[ ] Pulls to the Earth's center
[ ] Makes things fall to the ground
[ ] Does not hold the planets in orbit
[ ] Speeds you up as you go uphill
[ ] Holds atmosphere in place
[ ] Holds the moon in orbit

8. Write the correct letter in the blank before each word. (pp. 30–31)

friction  lubricant  air resistance  center of gravity  weight  mass  terminal speed  free fall

9. Compare and contrast: What is the same and what is different about inertia and momentum? (pp. 34–35)
They are similar because …
They are different because …

10. What is the difference between speed and velocity? (pp. 34–35)
Speed: _______
Velocity: _______

11. What is their unit of measure? (pp. 34–35)
_______

12. A washer uses _______ to remove water from clothes. The water flies out the holes in the drum in a straight line. (pp. 36–37)
(a) Friction produced by air flowing around a moving object
(b) Any liquid substance that reduces friction
(c) Force that slows things down

13. A heavier item with more mass needs ________ or less ________ for or to keep it moving in a circle? (Circle one) (pp. 36–37)
(a) less
(b) more

The Usborne Science Encyclopedia

1. The force _______ stops things from moving or slows them down when they are moving. (pp. 30–31)

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8. Write the correct letter in the blank. (pp. 30–31)
_______ friction _______ lubricant _______ air resistance _______ center of gravity _______ weight _______ mass _______ terminal speed _______ free fall

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The Usborne Science Encyclopedia

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   ______________________________________

3. How is air resistance related to friction? (pp. 30–31)
   ______________________________________

4. List two things you could do to reduce friction. (pp. 30–31)
   1) __________________________________________  2) __________________________________________

5. What is the point where a thing's weight balances called? (p. 32)
   ______________________________________

6. Which has more air resistance, a flat piece of paper or a similar sheet crumpled into a ball?
   (Circle the correct answer.) (p. 33)
   Why? ______________________________________

7. What does gravity do? Put an X by all that apply. (pp. 32–33)
   ☐ pull to the Earth's center ☐ makes things fall to the ground
   ☐ does not hold the planets in orbit ☐ speeds you up as you go uphill
   ☐ holds atmosphere in place ☐ holds the moon in orbit
8. Write the correct letter in the blank before each word. (pp. 30–33)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>friction</td>
<td>A) the speed of an object falling with no resistance to slow it down</td>
</tr>
<tr>
<td>lubricant</td>
<td>B) the point at which an object balances</td>
</tr>
<tr>
<td>air resistance</td>
<td>C) maximum speed at which an object will fall when it encounters air resistance</td>
</tr>
<tr>
<td>center of gravity</td>
<td>D) the gravitational force exerted on an object</td>
</tr>
<tr>
<td>weight</td>
<td>E) how much of a thing there is</td>
</tr>
<tr>
<td>mass</td>
<td>F) friction produced by air flowing around a moving object</td>
</tr>
<tr>
<td>terminal speed</td>
<td>G) any liquid substance that reduces friction</td>
</tr>
<tr>
<td>free fall</td>
<td>H) force that slows things down</td>
</tr>
</tbody>
</table>

9. Compare and Contrast: What is the same and what is different about inertia and momentum? (pp. 34–35)

<table>
<thead>
<tr>
<th>They are similar because …</th>
<th>They are different because …</th>
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</tbody>
</table>

10. What is the difference between speed and velocity? (pp. 34–35)

- Speed: _________________________________________________________________________________________
- Velocity: ________________________________________________________________________________________

11. What is their unit of measure? (pp. 34–35) __________________________________________________________

12. A washer uses ________________________________________________________ to remove water from clothes. The water flies out the holes in the drum in a straight line. (pp. 36–37)

13. A heavier item with more mass needs more or less force to keep it moving in a circle? (Circle one) (pp. 36–37)
# Science E—Weekly Subject List

<table>
<thead>
<tr>
<th>Week</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Roman numerals/metric system/time zones/heat energy/magnetism</td>
</tr>
<tr>
<td>2</td>
<td>energy/photosynthesis/food chain/food web/magnetism</td>
</tr>
<tr>
<td>3</td>
<td>force/air resistance/friction/gravity/speed/velocity/magnetism</td>
</tr>
<tr>
<td>4</td>
<td>floating/sinking/buoyancy/pressure/simple machines/magnetism</td>
</tr>
<tr>
<td>5</td>
<td>light/dark/bouncing light/mirrors/pictures/perspective/bending light/magnetism</td>
</tr>
<tr>
<td>6</td>
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