Science 4—Weekly Subject List

5-Day

Week	Subject
1	early Americana/electricity/inventions/wheels
2	early Americana/electricity/inventions/bicycles/catseyes
3	early Americana/electricity/inventions/transportation/flight
4	early Americana/electricity/inventions/gliders/planes/parachutes
5	early Americana/electricity/magnetism/inventions/aircraft/chocolate
6	electricity/magnetism/inventions/gum/chips
7	electricity/magnetism/inventions/dishwasher/vacuum cleaner
8	electricity/magnetism/inventions/microwave oven/toilet
9	electricity/magnetism/inventions/light bulb/lighting
10	electricity/magnetism/Alexander Graham Bell/telephone/phonograph
11	electrons/protons/neutrons/periodic table/electricity/inventions/audio recording/television
12	energy particles/atoms/particle accelerators/elements/X-rays/forensic science/molecules/liquids/solids/gases electricity/inventions/math machines/computers/communication devices
13	crystals/chemical compounds/energy particles/dark matter/water/electricity/inventions/jeans/zipper
14	metals/plastics/carbon/silicon/electricity/inventions/Velcro/nitrous oxide/chloroform
15	biomimicry/energy/nuclear power/alternative energy/physics/forces/electricity/inventions/lenses/eye glasses /bandages
16	gravity/black holes/Albert Einstein/time/pressure/sound vibrations/electricity/inventions/X-rays/paper
17	sound/heat energy/low temperatures/electrical current/electricity/inventions/books/moveable type/ballpoint pens
18	electrical charges/static electricity/lightning/Tesla coil/neurons/pacemakers/central nervous system /magnetism/electromagnetism/electricity/inventions/sticky notes/Braile
19	electromagnetic spectrum/microwaves/X-rays/light/lasers/color/electricity/inventions/writing tools/underwater inventions
20	optical illusions/light/shadows/magnetism/inventions/piano/camera
21	light/bending light/refraction/lenses/magnetism/everyday inventions/strange inventions
22	color/prisms/spectrum/light/dispersion/filters/magnetism/energy/potential energy
23	computers/Internet/World Wide Web/artificial intelligence/robotics/magnetism/kinds of energy/hot and cold
24	nanotechnology/genetics/DNA/cells/cloning/cybernetics/magnetism/energy/conduction/convection/ combustion
25	microscopes (optical/electron)/using a microscope/viewing paper, print, fibers, and fabrics/magnetism /explosions/fossil fuels
26	microscopes/archaeology/forensic science/viewing/hair/cells/magnetism/engines /food as fuel
27	microscopes/nucleus/DNA/genes/bacteria/viruses/medicine/vaccines/surgery/plant cells/plant food /magnetism/wasting energy/using energy
28	microscopes/plant reproduction/pollen/water plants/fungi/food science/insects/microscopic life/magnetism /Sun/extreme temperatures

29 microscopes/pests/insects/sand and rocks/ microfossils/ crystals/magnetism/Sun/energy cycle

30 microscopes/atoms/chain reactions/solar energy

31 buying a microscope/microscope equipment/advanced microscope techniques/magnetism/astronomy /universe/geothermal energy/wind and water power

32 space/solar system/sun/eclipses/Mercury/Venus/magnetism/biopower/electrical energy

33 Earth/Moon/Mars/Jupiter/Saturn/Uranus/magnetism/electricity/electric power/oil/coal/producers and consumers

34 Neptune/Pluto/asteroids/comets/meteors/ exploring space/famous astronauts/satellites and galaxies /magnetism/energy underground (power cables, pipes)/future energy

35 Milky Way galaxy/birth of stars/life of stars/variable stars/constellations/describing stars/magnetism/energy facts and figures/energy timeline

36 maps of the stars/constellations/home astronomy/star photographs/telescopes/astronomy facts/map of the moon/magnetism

SCIENCE 4 — WEEK 1 — SCHEDULE

Date:	Day 1 1	Day 2 2	Day 3 3	Day 4 4	Day 5 5
Diary of an Early American Boy	Author's Note, chaps. 1–2	pp. 12–19 (end before journal entry)	pp. 19–24		
Activity Sheet Questions N	#1–6	#7	#8–9		
5-Day: ***The Story of Inventions***					pp. 6–9 N
Activity Sheet Questions N					#10–15
Optional: Do Together		A Journal of Their Own N		Building Bridges N	
***Discover & Do Level 4* DVD** N				Science with Electricity Introduction, #11	
TOPS #32: Electricity				#1	
Supplies N	**We provide: NSK** — masking tape; **4SK** — aluminum foil, D-cell batteries, flashlight bulbs. **You provide:** scissors, pencil.				
Shopping/Planning List	**For next week:** foil ribbon from #1.				

Other Notes

The Story of Inventions

p. 6

"Prehistoric" refers to a time before written records and, as such, does not necessarily imply support of "cave men" in a macroevolutionary sense.

Do animals invent? The book offers the example of chimpanzee's tool-using abilities, but this is a far cry from inventing something like a television, cell phone, or the printing press! Using a rock to break open nuts is hardly an invention. Made in God's image, human beings are intelligent and creative, possessing a level of ingenuity that far exceeds anything in the animal world.

My Inventions Book

Rather than completing the Activity Sheet Questions we have provided for this book this year, you may prefer to have your children create a new page each week to add to their own *My Inventions Book*. Create a form for them to fill out after you finish the assigned reading to record information about one of the inventions you read about. The form may include the following:

(Use the name of the invention as the page's title)
Name of the Inventor:
What he or she invented:
Date:

What need was the inventor trying to meet with this invention? (For example, when Josephine Cochran invented the mechanical dishwasher, it was because she

was tired of doing dishes by hand! Remember: "Necessity is the mother of invention.")

Brief synopsis of the invention story:
When did the invention become popular?

You may want to work with them to complete this form the first few weeks, but before long they'll feel confident answering the information on their own.

Activity Sheets

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.

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 # 4TS1).

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 child could watch "Professor Ike" perform each of the assigned experiments from *The Usborne Book of Science Activities, Vol. 1*. 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.

Note to Mom or Dad: Please navigate your *Discover & Do Level 4 DVD* by using the DVD menu on your screen.

Optional: Do Together

Day 2: A Journal of Their Own

Help your children get into the spirit of reading *Diary of an Early American Boy* by encouraging them to start their own journal today. If they are excited about the idea, feel free to take a trip to the store to pick out a unique journal, special paper, and/or pens/pencils to use just for journaling.

Challenge them to think about what types of things about their daily existence might intrigue young readers 50 or 100 years from now. What would they find fascinating? What would they want to know more about? Use these discussions as starting points for journaling.

Urge your children to include their own illustrations, just like Noah Blake does in his journal. Can they bring their journal entries to life like Noah does? Let them spend as much time as they want working on this activity. The extra writing practice is just a bonus that you can "slip" by them if they're having fun!

Day 4: Building Bridges

This week, your children read about building a new bridge across Red Man Brook. What did they think of the process described? Could they imagine helping out with such a huge project? Why or why not?

If at all possible, take a field trip to view a local bridge up close. It could be a long suspension bridge across a river or a bay, or a simple one-lane country bridge across a mostly-dry creek bed. Size and type doesn't matter a bit. Just try to find a bridge structure of some type (a walking bridge in a local park would work fine, too).

If possible, take the time to travel back and forth across the bridge. Is it possible to walk across on foot? Can you walk under or around it? How close can you get to examine it in depth? Can your children point out any similar features to the bridge Noah Blake described in his journal? How are they similar? What major differences do they see?

Have fun with this activity, and use it as an opportunity to bring their reading assignments to life in a unique way. Encourage curiosity and discussion. Feel free to go off on a tangent, if your children's interests lead down a new and interesting path.

Week 1 Activity Sheets

Diary of an Early American Boy

1. Talk it out question: Demonstrate/explain comprehension verbally to Mom or Dad. The author says the good things of the past were not so often articles (things) as they were what? (p. viii)

_____

_____

2. What does he particularly admire or not admire about old things? (p. viii)

He does not admire	He does admire

3. What evidence does he give for the idea that people were very aware of the time in which they lived? (p. viii)

_____

4. What are some good rules to keep in mind when keeping and handling an axe? List three. (pp. 8-9)

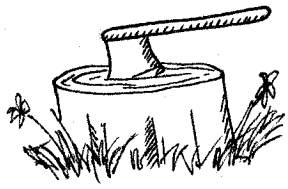
_____

_____

_____

_____

_____



5. Why was the loft the warmest spot in the house? (p. 10) _____

_____

_____

SCIENCE 4	WEEK 18				SCHEDULE
Date:	**Day 1** 86	**Day 2** 87	**Day 3** 88	**Day 4** 89	**Day 5** 90
Mysteries and Marvels of Science	pp. 60–61 N	pp. 62–65	pp. 66–67		
Activity Sheet Questions	#1–4	#5–11	#12–17		
5-Day: ***The Story of Inventions***					pp. 74–77
Activity Sheet Questions					#18–21
Optional: Do Together	Telsa Coil N			Magnetic Field N	
Discover & Do Level 4 **DVD**				#29	
TOPS #32: Electricity				#19	
Supplies	**We provide: NSK** — tape, clothespins. **4SK** — aluminum foil. **You provide:** scissors, circuit from #8.				
Shopping/Planning List	**For next week:** pennies, circuit from #8.				

Other Notes

Mysteries and Marvels of Science

p. 61

Nikola Tesla (1856–1943) invented the Tesla coil in 1891.

The Faraday Cage is named after English scientist Michael Faraday (1791–1867). But what is it? It's not where he kept his pet parakeets, but has to do with electricity. We'll return to the Faraday cage in a moment, but first let's take a brief look at Faraday's interesting life.

Michael Faraday had the privilege of serving as assistant to a chemist named Humphrey Davy (1778–1829), who brought Faraday along on a visit to key scientists in Europe. In the field of chemistry he discovered how to liquefy chlorine and also discovered benzene. But Faraday's work in the area of electricity is how he is remembered best. He studied electromagnetism, created an electric motor, made an electrical generator, and expressed the laws of electrolysis.

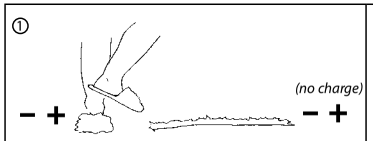
A committed Christian, one biographer of Faraday wrote of him, "Faraday's Christian testimony has also helped mold people in modern times. The firmness of his faith and his determination to follow the Sermon on the Mount have influenced our age as much as or more than his studies on magnetism and electricity" (Charles Ludwig, *Michael Faraday: Father of Electronics* [Herald Press, 1978], p. 204).

Week 18 Activity Sheets

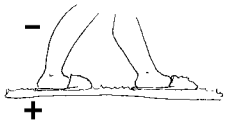
Mysteries and Marvels of Science

1. If you shuffle your feet on carpet in a dry climate, you may produce an electric shock when you reach for a metal object. Fill in the blanks to explain why this happens. **Challenge:** Draw +'s and −'s on the pictures 1-3 to show which objects carry which kind of charge. (p. 60)

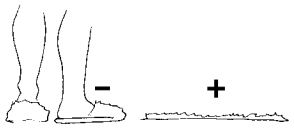
negative	electrons	neutral	conductor

① 

A person in fuzzy slippers and a piece of carpet are both electrically _(neutral)_.

② 

When they rub together, _(electrons)_ will transfer from one object to the other.

③ 

This transfer gives one object a _(negative)_ charge, and the other a positive charge.

④ 

When a charged object nears a good conductor, the built-up electrons leap to the _(conductor)_ to make the charged object neutral again.

2. What kind of electricity is described above? (p. 60) _(static electricity)_

3. Name two factors that determine how much static charge can be built up in two insulators. (p. 60)
   1) _(the material that makes up the insulators)_
   2) _(the amount of surface area that makes contact between the two insulators)_

4. Can lightning happen above clouds? Explain. (p. 61) _(Yes—sometimes storm clouds generate lighting in the top part of the cloud instead of the bottom; this lightning might appear as a red, jellyfish shaped burst of light scientists call a "sprite", or a blue flash, called a jet.)_

Week 18 Activity Sheets

5. Which body system uses electricity to relay messages? (p. 62)

- ☐ the circulatory system
- ☐ the respiratory system
- ☐ the skeletal system
- ☒ the nervous system

6. How is electricity used in the circulatory system? (p. 63) _(pacemakers use electricity to make the heart pump blood around the body)_

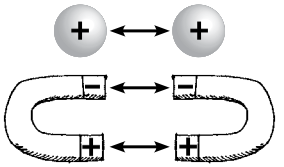
7. Match each term to the correct definition. (p. 63)

neuron	made up of the brain and spinal cord; interprets information from the senses and sends commands through neuron chains
neurotransmitters	the basic nerve cell of the nervous system
central nervous system	generated when a neuron senses something; travels through neurons as a message to the brain
electrical pulse	chemicals released by neurons that allow electrical pulses to travel from one neuron to the next

Talk it out then write it down: Explain your answer verbally to Mom or Dad, then write it below. Use the terms above to help you describe how a message travels from your finger to your brain.

(When your finger senses something, a neuron generates an electric pulse. Simultaneously, the neuron produces chemicals called neurotransmitters that allow the electric pulse to travel across the gap between one neuron and then next. The pulse travels this way—through neurotransmitters from one neuron to the next—to the brain.)

8. How are magnetic poles like electrical charges? (p. 64)
   (identical poles push each other away, just like identical charges do; both opposite poles and opposite charges attract each other.)

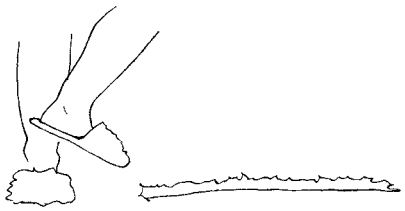
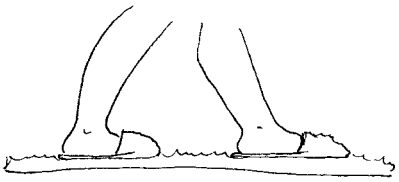
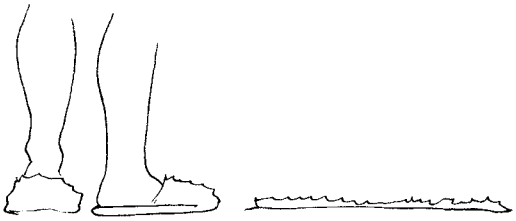


©2009 by Sonlight Curriculum, Ltd. All rights reserved.

Mysteries and Marvels of Science

1. If you shuffle your feet on carpet in a dry climate, you may produce an electric shock when you reach for a metal object. Fill in the blanks to explain why this happens. **Challenge:** Draw **+**'s and **—**'s on the pictures 1-3 to show which objects carry which kind of charge. (p. 60)

negative	electrons	neutral	conductor

①  A person in fuzzy slippers and a piece of carpet are both electrically _____.	②  When they rub together, _____ will transfer from one object to the other.
③  This transfer gives one object a _____ charge, and the other a positive charge.	④  When a charged object nears a good conductor, the built-up electrons leap to the _____ to make the charged object neutral again.

2. What kind of electricity is described above? (p. 60) _____

3. Name two factors that determine how much static charge can be built up in two insulators. (p. 60)

   1) _____

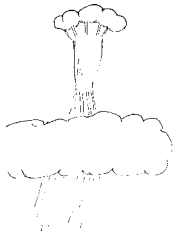
   2) _____

4. Can lightning happen above clouds? Explain. (p. 61) _____

   _____

   _____

   _____



SCIENCE 4 — WEEK 36 — SCHEDULE

Date:	Day 1 176	Day 2 177	Day 3 178	Day 4 179	Day 5 180
Astronomy and Space	pp. 59–75	pp. 76–80 N	pp. 81–87 N		
Activity Sheet Questions		#1–5	#6–23		
5-Day: ***Energy***					Catch up N
Optional: Do Together	Science … Fiction? N			Favorite Activity N	
Discover & Do Level 4 **DVD**				#58	
TOPS #33: Magnetism				#20	
Activity Sheet Questions				#24–29	
Supplies	**We Provide: NSK** — tape, magnets. **4SK** — D-cell battery, index card. **You provide:** thin cardboard (manila folder) 9"x11," 2 clothes hangers, books, rice, unused staples.				

Other Notes

You're All Done!

Astronomy and Space

pp. 76–77

If you decide to buy some binoculars for astronomy use, one other tip is useful. If you or your children wear glasses, it's helpful to get a pair of binoculars that have rubbery eyepieces that can be folded down when looking through them with glasses on. This makes it easier to keep your glasses on and still get the most out of your binoculars.

An alternative to buying expensive telescopes or binoculars is to find out about astronomy clubs in your area. Such groups meet regularly and usually several members have great telescopes and binoculars that you can use. Seeing pictures of the night sky in books is one thing, but you and your children will be amazed by some of the sights you can see for yourself through a great telescope.

pp. 82–83

As you've probably noticed by now, the study of astronomy is also a great time to study Greek and Roman mythology. Descriptions of famous constellations, for instance, introduce a number of popular Greek myths.

Week 36 Activity Sheets

Book of Astronomy & Space

1. Compare and contrast using binoculars or a telescope to look at the night sky. What are the pros and cons of each? (pp. 76-77)

Binoculars	Telescope
Pros: *(less expensive; made in different sizes and powers)*	**Pros:** *(show the sky more clearly)*
Cons: *(if they're bigger, they're heavier and may be difficult to hold steady—may require a tripod to use effectively)*	**Cons:** *(are very expensive—cheaper ones are not very good and it would be more worthwhile to spend the same amount of money on good binoculars)*

2. **Challenge!** Why do you think flashlight glare would make it hard to see the night sky? (p. 77)
(because our pupils dilate to see better in the dark, but if we turn to look at white light from the flashlight on a piece of paper, our pupils must constrict to keep too much light from getting in. We would have to wait for our eyes to get used to the dark again before we could see the sky very well.)

3. Why do stars look blurred in some photographs? (p. 79) *(because the Earth spins, so the stars are always moving through the sky)*
How do photographers capture this effect? *(by leaving the shutters on their cameras open for a long time, so the light from each star slowly moves from a point into a line across the film)*

4. Which type of telescope uses mirrors to bring an image to your eye? (p. 80)
reflector telescope **refractor telescope**

5. Which type of mount allows you to follow the curved path of a star across the sky? (p. 80)
altazimuth mount **equatorial mount**

©2009 by Sonlight Curriculum, Ltd. All rights reserved.

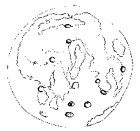
Week 36 Activity Sheets

6. Briefly describe one of the two constellation stories described in your book—either Perseus or Orion—or a different constellation story of your choice. (p. 82)
(See the text in the book to check your child's synopsis)

7. Think about it: The constellation stories we hear most often are based on Greek or Roman mythology. Do you think these are the only stories that exist about groups of stars? Why or why not? (p. 82)
(No, many cultures around the world have stories to describe the patterns they saw in the sky that were based on stories or characters that were important in their culture.)

8. Why should you turn the book upside down if you are looking at the moon through a telescope? (p. 83)
(because most astronomical telescopes make objects in the sky appear upside down)

9. What do you remember from your reading about the size of the crater Copernicus? (p. 83)
(Hint: see page 24)
(it is so large that a city the size of London could fit inside it!)
The next time you see a full moon, see if you can find it!



10. Fill in the missing information to complete the chart below. (pp. 84-85)

Star Facts

Name of Star	Name of Constellation	Spectral Type	Double or Variable?
Sirius (A)	*(Canis Major)*	*(A)*	neither
(Arcturus)	Boötes	K	*(neither)*
Altair	*(Aquila)*	*(A)*	neither
Beta Capricorni	*(Capricornus)*	—	*(physical double)*
(Mira)	Cetus	—	long-period variable

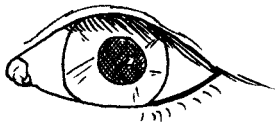
©2009 by Sonlight Curriculum, Ltd. All rights reserved.

Book of Astronomy & Space

1. Compare and contrast using binoculars or a telescope to look at the night sky. What are the pros and cons of each? (pp. 76-77)

Binoculars	**Telescope**
Pros:	**Pros:**
Cons:	**Cons:**

2. **Challenge!** Why do you think flashlight glare would make it hard to see the night sky? (p. 77)



3. Why do stars look blurred in some photographs? (p. 79) _____

How do photographers capture this effect? _____

4. Which type of telescope uses mirrors to bring an image to your eye? (p. 80)

reflector telescope **refractor telescope**

5. Which type of mount allows you to follow the curved path of a star across the sky? (p. 80)

altazimuth mount **equatorial mount**

Cut-Out Sheets

Cut-Out #1

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.

Cut-Out #2

The electromagnet attracts the arm
and pulls on the hammer.

The spring pulls and the hammer strikes the bell.

Electricity flows through the
electromagnet and becomes magnetic.

Pushing the button closes the circuit
and causes the electricity to flow.

As the hammer pulls back, it loses
contact with the wire and breaks the current.
The electromagnet stops working.