

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	#1–6	#7	#8–9			
5-Day: The Story of Inventions					pp. 6–9 [N]	
Activity Sheet Questions [N] ¹					#10–15	
Optional: Do Together		A Journal of Their Own [N] ¹		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						

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1. The [N] symbol means there is a note immediately following the schedule.

5-Day: 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 children could watch “Professor Justin” perform each of the assigned experiments from the *TOPS* science activity books. 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.



Diary of an Early American Boy

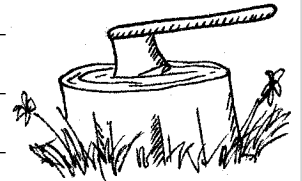
1. Talk it out question: Demonstrate/explain comprehension verbally to Mom or Dad. The author says the good things of the past were not so often articles (things) as they were what? (p. viii)

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	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			Magnetic Field	
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					

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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		(no charge)		
	A person in fuzzy slippers and a piece of carpet are both electrically <u>(neutral)</u> .		When they rub together, <u>(electrons)</u> will transfer from one object to the other.	
③				
	This transfer gives one object a <u>(negative)</u> charge, and the other a positive charge.		When a charged object nears a good conductor, the built-up electrons leap to the <u>(conductor)</u> 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)
- (the material that makes up the insulators)
 - (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 lightning 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 skeletal system

the respiratory 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)

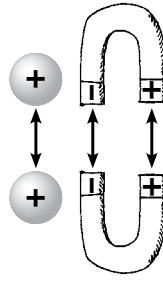
neuron		made up of the brain and spinal cord; interprets information from the senses and sends commands through neuron chains
neurotransmitters		the basic nerve cell of the nervous system
central nervous system		generated when a neuron senses something; travels through neurons as a message to the brain
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)

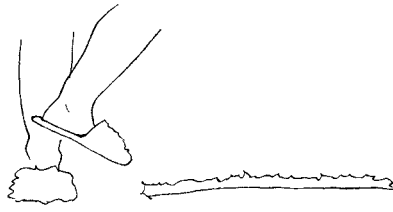
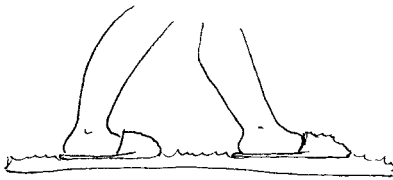
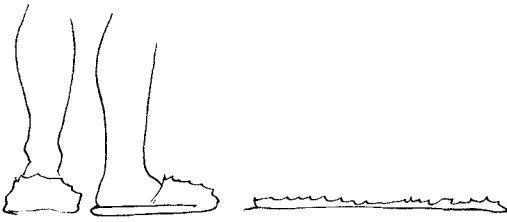

(Identical poles push each other away, just like identical charges do; both opposite poles and opposite charges attract each other.)





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

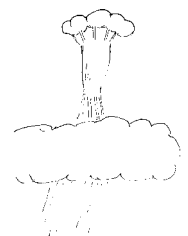
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2. What kind of electricity is described above? (p. 60) _____

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 <small>176</small>	Day 2 <small>177</small>	Day 3 <small>178</small>	Day 4 <small>179</small>	Day 5 <small>180</small>
Astronomy and Space	pp. 59–75	pp. 76–80	pp. 81–87		
Activity Sheet Questions		#1–5	#6–23		
5-Day: Energy					Catch up
Optional: Do Together	Science ... Fiction?			Favorite Activity	
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!

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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.

Since a lot of classic literature refers to mythology, such as the plays of Shakespeare, it's helpful for you and your children to have some background in mythology, even if it's just a simple A to Z guide.

pp. 88-91

We have not scheduled "Landmarks of Astronomy" or "Questions and Answers" in *Astronomy and Space*. If you would like to read them on your own, here are a few things to note:

pp. 88-89

Unlike some other recent books that use BCE or CE, this one still uses BC and AD, explained at the bottom of page 88. This usage underscores the significance of Christ in history.

pp. 90-91

The first question and answer on the top left of page 90 reveals, "According to scientists, there was nothing before the Big Bang. Time itself started with the Big Bang." If this is the case, then where did everything come from? Christian theism argues that, "In the beginning God created the heavens and the earth" (Genesis 1:1), meaning that before creation, God existed. He did not form pre-existing matter or "stuff" in order to make the universe, but created everything from nothing (*ex nihilo*). But if a worldview excludes God, such as naturalism does, the best solution to what existed before the universe began is nothing (or to claim that the universe has always existed). But, given the Big Bang, how did something come from nothing? This principle appears to violate what we know about physics — from nothing, nothing comes. Does it make more sense to claim that the universe and everything in it came out of nothing as a result of chance and time, or that the universe had an intelligent cause?

On "2.9 million years ago," "4,500 million to 5,000 million years [4.5 to 5 billion]," and similar references on these pages to millions or billions of years, see our note in the Introduction.

5-Day:Energy

Catch up

Use this time to do any assignment that you have not had time for this year.

pp. 60-61

On references to "millions" and "billions" of years ago, see our note in the Introduction.

Optional: Do Together

Day 1: Science ... Fiction?

Today, let your children pick out a science fiction movie to watch together. Do they enjoy Star Wars? Star Trek? Battlestar Galactica? Something else?

Enjoy the "break" from serious astronomy study, but use the time as an opportunity to discuss what's possible and what's truly fiction in the movie, based upon what they've learned about space so far.

Could the Millennium Falcon really travel that fast? Do aliens really exist on other planets? Could humans really live and survive as they do in the movies? Why or why not? Let them know it's OK to assume that technology will progress rapidly in the future. But, based upon what they've learned so far, what things are a bit too much of a stretch to believe? Have fun watching them try to discern potential truth from true science fiction!

Day 4: Favorite Activity

Today, let your children wrap up the year by choosing one activity to do from anything you've done together this year. It doesn't have to be related to anything they've read this week. Just ask them to think back about all you've done together this year.

What did they enjoy the most? What would they really like to do again? Indulge their preferences and have fun repeating their favorite activity from this year. We hope you and they had fun! ■

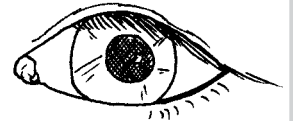


Book of Astronomy & Space

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
<p>Pros:</p> <hr/> <hr/>	<p>Pros:</p> <hr/> <hr/>
<p>Cons:</p> <hr/> <hr/>	<p>Cons:</p> <hr/> <hr/>

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



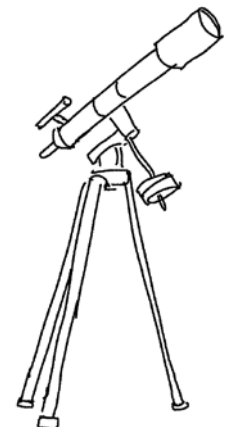
3. Why do stars look blurred in some photographs? (p. 79) _____

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.