

Introduction to Foundations of Science: Science and Creation (Year 1)

Using the Bible to Teach Science:

Our curriculum combines grades 4-12 together for science each day. Our plan covers the six days of creation over the entire school year and is designed to be done together as a whole family, with additional independent reading and research assignments for high-school students. Our plan is to offer this as a 4-year sequence, giving students the opportunity to visit each topic repeatedly and in greater depth.

All the science we will study over our 4-year curriculum is firmly based upon the creation of the world by YHWH.

- We believe that Scripture teaches **YHWH created the world** in six literal, consecutive 24-hour days.
- We believe that **the Flood of Noah's day** was a worldwide, literal flood. It was a significant geological event and much (but not all) fossil sediment originated at that time.
- We believe that the **gap theory has no basis** in Scripture.
- We believe that no apparent, perceived or claimed **evidence in science** can be valid if it contradicts the scriptural record. Of primary importance is the fact that evidence is always subject to interpretation by fallible people who do not possess all information.

We also attempt to emphasize some things in our curriculum:

- We seek to teach our students to **think logically and carefully** about the created world. We emphasize the scientific method, which consists of observing (gathering facts), hypothesizing (suggesting explanations), and experimenting (testing explanations).
- We teach that **science is inseparable from mathematics**, which we call the "language of science." We teach our students to be precise, exact, and careful when interacting with God's world.
- We acknowledge that **we are made in the image of a Creator**, and we hope to cultivate creativity in our children and constant appreciation of the created world. (We try to avoid the use of the word "nature," choosing to use the word "creation" instead.) While teaching responsibility and stewardship of God's creation (Genesis 1:28), we also seek to worship the Creator, rather than created things, in all that we do (Romans 1:18-32).

Homeschooling Torah's science curriculum is different from most other publishers. It is typical to study science by topics, spending up to a year at a time studying biology, chemistry, physics, geology, anatomy, etc.

However, because we want to use the Bible as our primary textbook, we use a more holistic approach to studying science. Because we view Scripture as absolute truth, we want to see YHWH's creation from His perspective.

For instance, why did He create light before creating plants? How can studying things in the order in which they happened help us understand their properties better? In later years, how does the Flood affect the created world we see around us? When we study science found in Job, the Psalms, the Prophets, or the New Testament, how does the context of the passage help us understand why that particular scientific principle is being discussed?

We believe that seeing science from a biblical perspective, rather than a man-made, evolutionary perspective, can help us see things from the Creator's viewpoint. We were first inspired to use this unique order when studying the writings of Sir Isaac Newton. He is credited with many scientific discoveries and even laws of science, which is amazing because even Einstein only has theories. Newton credits his success in science to studying the Scriptures verse by verse, then asking questions of the text, taking it very literally. Our hypothesis is that students will be able to think MORE scientifically if they read the Scriptures FIRST, even though it's not the way the public schools do it.

**“I have more understanding than all my teachers,
For Your testimonies are my meditation” (Psalm 119:99).**

Topics Covered in Year 1

- **Light, Energy, and Matter (Creation Day 1)** – Topics include magnetism, electricity and currents, motion, force, light and sound waves, color, gravity, radiation, electronics.
- **Water and Atmosphere (Creation Day 2)** – Topics include water, oceanography, molecules, atmosphere, weather.
- **Land and Plants (Creation Day 3)** – Topics include rocks, minerals, elements, chemical reactions, earthquakes, plants, flowers, seeds, trees, fungi, mold, bacteria.
- **Sun, Moon, and Stars (Creation Day 4)** – Topics include the moon and moon phases, planets, constellations, eclipses, galaxies, meteors, star clusters, comets, asteroids, calendars, and the study of space.
- **Birds and Sea Life (Creation Day 5)** – Topics include birds, fish, amphibians, environmental science.
- **Land Animals and Man (Creation Day 6)** – Topics include fossils, reptiles, mammals, insects, invertebrates, classification systems, microbiology, human anatomy and physiology, disease.
- **Sabbath and the Importance of Rest in Creation (Creation Day 7)**

Topics Covered in Year 2

Year 2 covers the account of the global flood of Genesis (Genesis 2-11), examining the changes made to our earth and to the way we understand science. Topics include **biology** (cellular

biology, genetics, microbiology, botany, zoology), **chemistry** (chemical composition and reactions, stoichiometry, gases, thermodynamics), and **physics** (magnetism, motion and wave theory).

Topics Covered in Year 3

Year 3 covers scientific topics addressed in the Torah, the Tanakh, and the Apostolic Scriptures. Topics include **biology** (cellular biology, taxonomy, human anatomy and physiology), **chemistry** (atomic theory, kinetics), and **physics** (classical mechanics, work and energy, electricity, optics, nuclear physics). The scientific method and historical applications of Scripture are emphasized.

Topics Covered in Year 4

Year 4 covers the life, studies, discoveries, and inventions of famous scientists in world history, examining how closely their views aligned with Scripture and how Scripture helped them understand YHWH's world. Scientists include the following:

- | | | |
|--------------|---------------|----------------|
| • Aristotle | • Goodyear | • Maury |
| • Babbage | • Grosseteste | • Maxwell |
| • Bacon | • Haber | • Morris |
| • Bohr | • Harvey | • Morse |
| • Boyle | • Herschel | • Newton |
| • von Braun | • Howell | • Pascal |
| • Carnot | • Huygens | • Pasteur |
| • Carver | • Irwin | • Planck |
| • Copernicus | • Job | • Pottenger |
| • Damadian | • Joule | • Price |
| • Darwin | • Kelvin | • Riemann |
| • Einstein | • Kepler | • Rumford |
| • Enoch | • Leavitt | • Solomon |
| • Faraday | • Leeuwenhoek | • da Vinci |
| • Galileo | • Linnaeus | • Wilder-Smith |
| • Gilbert | • Lumsden | • Young |

Hear, Learn, Keep, Do

When God wants to teach mankind something, He follows a very specific method that I can copy in my homeschooling. For instance, let's look at how God teaches all mankind about His "invisible qualities, his eternal power, and divine nature":

*"The wrath of God is being revealed from heaven against all the godlessness and wickedness of men who suppress the truth by their wickedness, since what may be known about God is plain to them, because **God has made it plain to them**. For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that men are without excuse" (Romans 1:18-20).*

First, **God clearly presents information**. In this case, He used the things He had created, which can be seen by every person no matter where he lives, to make Himself plain to all people.¹ The sun, moon, and stars are visible to all. The amazing capabilities of the human body are visible to all. The metamorphosis of a caterpillar into a butterfly... the water cycle... the fossil record — these are visible to all.

Once God has presented information, **He expects that I'll have the help of a human teacher** to explain what I'm seeing and hearing.

"How, then, can they call on the one they have not believed in? And how can they believe in the one of whom they have not heard? And how can they hear without someone preaching to them?" (Romans 10:14).

He then expects me, the "student," to do a few things, which I'm calling the "Hear, Learn, Keep, Do" method (from Deuteronomy 5:1).

"And Moses called all Israel, and said unto them, Hear, O Israel, the statutes and judgments which I speak in your ears this day, that ye may learn them, and keep, and do them" (KJV).

1. The student is to "hear."

To hear doesn't mean to let sound come into my eardrums; rather, it means to "**listen with intelligence**." I can look up into the night sky and "see" the stars, but unless I "listen with intelligence," I won't relate those stars to a Creator God, to His eternal power and divine nature.

When I was a little girl, my parents would wake us in the middle of the night and take us out into the backyard, where they had laid a blanket on the ground. We would lie on our backs and

¹ Psalm 8

look at a meteor shower, an eclipse, or an especially bright planet. My dad would pass around the binoculars and telescopes, and he would show us where the constellations were. All the while, he would remind us that **God created these things**. He helped us “listen with intelligence” to the “words” God had put into the stars.

Today I can go to my bookshelf and read *The Witness of the Stars*, by E. W. Bullinger, to learn how the different constellations point to God as creator and to His promised Redeemer.

All of these things can help me “listen with intelligence” to the God who is trying to teach me about Himself.

2. The student is to “learn.”

The word “to learn” means **“to goad.”** My human teacher helps me learn by “goad” me. A goad is a long stick with a sharp end, used to herd animals like cattle. With me, my human teacher pokes me along, but this isn’t a negative thing. My teacher spurs me into action, reminds me where the path is, and even gives me confidence as I step by encouraging me. In the New Testament, we see the word “exhort” used in a similar way.

If I were a child learning about the constellations, this would be a review lesson, where maybe I would draw maps of the constellations, with overlays of the symbolism of Jesus the Messiah, filing them away in a notebook. Maybe my father would take me outside on another night and ask me to point to the specific constellations and tell him a little about each one. Maybe I would be required to memorize Scripture verses about each one and recite them at supper. All along, my “teacher” would be goading me, poking me, reminding me that God was the creator of the constellations and that they were placed in the sky by Him so that I would learn about His eternal power and divine nature.

3. The student is to “keep.”

The word “keep” used here means **“to guard.”** My husband and sons love to study about medieval castles, which often had a “keep” inside the walls, where the soldiers could fall back during a siege. It was a place of refuge, heavily guarded and fortified, and filled with ample provisions. Often this was a strong tower. Sometimes the “keep” was a dungeon, where prisoners would be “kept” and guarded.

When God gives us a body of information, He wants us to guard it carefully. All of Scripture contains information about God, but we should not guard it physically so that no one is able to read it, such as often happened during the Middle Ages as Bibles were chained to tables inside cathedrals, to keep thieves from stealing these rare books. In this case, He’s referring to a *mental* guarding of this information, where we replay it over and over so that it doesn’t get lost or misplaced among all the other pieces of information that compete.

For instance, the word “keep” is used 22 times in Psalm 119 alone, as we are instructed to “keep” God’s commands and instructions.

In my illustration of learning the constellations, I would “keep” or guard what I had learned by reviewing it, over and over and over again, so that I would not forget it. God uses the method of writing things down so that mankind doesn’t forget it. In addition, He “schedules” times into His calendar so that we remember to review what He has taught us (Leviticus 23). He has His people “recite” and “repeat” what He has taught them. Finally, He “tests” them on what He has taught, to be sure that they understand and know it well.

4. The student is to “do.”

James 1:22-25 says that when we learn God’s Word, even when we listen to it, our human hearts are very prone to walking away and “immediately forgetting” what we saw. God’s “perfect law” gives freedom, though, to the one who “looks intently” into it and “continues to do” it, “not forgetting what he has heard, but doing it.” God says that man will be “blessed in what he does.”

Learning information is never the end goal. When God placed the stars in the sky, they were there to point us to the Messiah and to bring us to faith in Him. Yeshua is always the reason for everything God has revealed to us.

“Wherefore the law was our schoolmaster to bring us unto Messiah, that we might be justified by faith. But after that faith is come, we are no longer under a schoolmaster. For ye are all the children of God by faith in Messiah Yeshua” (Galatians 3:24-26, KJV).

“For Messiah is the end [“result, purpose, goal”] of the law for righteousness to everyone that believeth” (Romans 10:4, KJV).

“We have much to say about this, but it is hard to explain because you are slow to learn. In fact, though by this time you ought to be teachers, you need someone to teach you the elementary truths of God’s word all over again. You need milk, not solid food! Anyone who lives on milk, being still an infant, is not acquainted with the teaching about righteousness. But solid food is for the mature, who by constant use have trained themselves to distinguish good from evil” (Hebrews 5:11-14, NIV).

Going to school isn’t the point. Learning facts isn’t the goal. Learning should bring about a change in behavior.

We would be disappointed if we had to homeschool our children for the rest of their lives. No way! We expect them to graduate someday. When they graduate, they will continue to add, subtract, multiply, and divide — but they won’t be doing it on math worksheets. They’ll be applying math to their everyday lives.

God revealed Yeshua throughout all His Word, not so we could master facts, rules, or commands. He revealed Himself so that, as we continue to obey His instructions each day of our lives, we will be able to hear intelligently that we need a redeemer, we'll be goaded each day by the keeping of His commands, we'll have plenty of review as we continue to walk in His commands, and we'll see our need of a Messiah and turn to Him in faith, so that His righteousness can be given to us. Then we can *grow up*, teaching God's commands to others and helping others come to faith in Him also.

Sounds like what parents do, doesn't it? We learn, we grow up, we have children of our own, and we pass on truth to them.

*For a more thorough look at our philosophy of education, we suggest **Biblical Home Education**, by Anne Elliott (Foundations Press, 2011). This book is included in your Homeschooling Torah membership, under the free e-books in the Parent Resource section of the website.*

Features of Our Science Curriculum:

- Each “week” of lesson plans is set up so that **3 days will be spent discussing science topics with the Parent**, then **2 more days of study, projects, and review can be done relatively independently**. In a typical homeschool, the parent and children spend three days a week studying science together. Expect this to take about an hour per day. However, two days a week are planned where the children can do science mostly independent of the parent. This can help you have time to accomplish housework, errands, and other responsibilities. You are always welcome to do *more* than the curriculum suggests.
- **Memorization** is an important part of our curriculum, so that students will have a mental “handle” on which they can hang all of the other things they learn. We strongly emphasize the days of Creation on which God made things, and we learn the history of scientific inventions and discoveries. We emphasize especially the Latin and Greek roots of scientific words, to promote literacy and the ability to interact with scientists and academic literature in the sciences. For this reason, you will begin each week by learning science vocabulary words. A dictionary will be needed. Online dictionaries will work just fine! Try to help your children put definitions into their own words, simplifying things as much as possible. Understanding is the most important thing!
- We have utilized online resources extensively in our curriculum, to save you the added expense of purchasing additional books and materials. ***You will need Internet access for many of the lessons.***
- We have scheduled topics of **discussion** to go with each topic. However, don’t feel that you must limit the discussion to only these things! Mom should feel free to discuss things that she knows are important to her family. Allow the Holy Spirit to guide you as you learn together.
- We provide at least weekly opportunities for science to be “**hands on**.” However, out of respect for your budget and energy levels, we try to use supplies that are readily available around your home.
- We do suggest ways to spend time outside **observing Creation**, but because we ourselves live in a cold climate where we can’t always watch things grow or stay outside too long, we offer other options for families who also have difficulty getting outside at all times of the year or might live in an urban environment.
- Throughout the year, we will be constructing a **science notebook**. At least once each week, we schedule a “notebooking” activity that your children can mostly do independently. Provide them with supplies, such as colored pencils, markers, pretty papers, glue, and special scissors. Younger children might want to dictate a paragraph to

Mom, which she could then type and print out, to be included in their notebooks. Some families like to have their children notebook several times a day. Other families skip notebooking altogether, just having their children “tell back” (narrate) to them what they have learned.

- Some activities are simply listed as **research projects**, such as, “Visit a public library or do research online on the migration of birds.” These could be used as notebooking activities, as writing assignments, or as parts of larger reports or projects. Do what works best for your family!
- **High school students** are ready to discuss and interact with many of these topics on a much deeper level than younger students. We recommend that you take many of the weekly notebooking topics and require 2-3 pages of essays from your high school students. You may wish to pose controversial questions of your students and ask them to defend their positions. We have also included additional reading assignments, research projects, and application activities for high school students. Some of these are more difficult than others, so use your discretion in what you require of your own students. Resources and e-books are available for free online but if your budget allows, consider purchasing hard-copy books, since it will be easier for your student to read, to highlight, and to take notes.

A Further Word About High School:

As already mentioned, we use a holistic approach to studying the Bible and what it says about science. This will not match the typical high-school sequence for science, which is typically earth science, biology, chemistry, and physics.

If your student already started high school, and if he is on a certain “track” and wants to maintain that, you might not want to use our science curriculum.

Ours uses more of a spiral approach over 4 years, covering biology, chemistry, earth science, and physics for a short time each year, then returning to do more the next year. It works best for students just beginning 9th grade, unless your older student is not intending to need a typical high-school study schedule for college or a future career.

However, a student just beginning 9th grade *will* cover the normal subjects covered in any high school and can expect to learn what is needed for a regular high-school science education.

We like Science for High School, mixed with some videos and lab demonstrations from Khan Academy, although neither is Torah observant, of course.

- <http://www.scienceforhighschool.com/how-to-use>
- <https://www.khanacademy.org>

Internet Studies:

Throughout this curriculum, we recommend various websites to study topics in further depth. If you do not have access to the Internet, a local library should be able to provide you with many similar resources.

Please use discretion when using any website, including the ones we recommend, and always supervise your children when using the Internet.

Please contact us if any link does not work so that we may update it.

About Foundations of Science

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Scripture taken from the King James Version of the Bible, unless otherwise noted.

“Therefore all things whatsoever ye would that men should do to you, do ye even so to them” (Matthew 7:12).

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FOUNDATIONS OF SCIENCE – YEAR 1

SUPPLY LIST

WEEK 1

- ☐ cotton swabs
- ☐ unsweetened baking cocoa
- ☐ lemon juice
- ☐ salt
- ☐ honey

WEEK 2

- ☐ rope or heavy string
- ☐ 1 large flat pan, 4-5 inches deep
- ☐ electric or paper fan
- ☐ bucket or jug
- ☐ food coloring (optional)
- ☐ 5 large marbles or ball bearings

WEEK 3

- ☐ balloons

WEEK 4

- ☐ flashlight
- ☐ aluminum foil

WEEK 5

- ☐ mirror
- ☐ aluminum foil
- ☐ a piece of colored paper (red, green, or blue)
- ☐ a piece of black paper

WEEK 6

- ☐ toothpicks
- ☐ playdough or modeling clay
 - make your own play dough in 4 minutes: <http://theimaginationtree.com/2012/04/best-ever-no-cook-play-dough-recipe.html>

WEEK 7

- ☐ large balloons
- ☐ string
- ☐ yard stick
- ☐ skewer or something sharp to pop the balloons

WEEK 8

- ☐ 2-liter clear plastic pop bottle
- ☐ matches

WEEK 9

- ☐ food coloring (different colors)
- ☐ table salt
- ☐ large baking dish

WEEK 10

- ☐ 2-liter clear plastic pop bottle
- ☐ drill (to make holes in the bottle)
- ☐ scotch tape

WEEK 11

- ☐ none

WEEK 12

- ☐ seeds for sprouting

WEEK 13

- ☐ celery
- ☐ red food coloring
- ☐ broccoli

WEEK 14

- ☐ one flower per child
- ☐ sketch pad
- ☐ magnifying glass (optional)

WEEK 15

- ☐ 1 round piece of cardboard about 1 foot across (the cardboard from a frozen pizza works well)
- ☐ colored construction paper
- ☐ scissors
- ☐ tape
- ☐ string
- ☐ pencil, crayons, markers
- ☐ a geometry compass (for making circles)

WEEK 16

- ☐ none

WEEK 17

- ☐ none

WEEK 18

- ☐ yarn or string
- ☐ modeling clay
- ☐ notebook-sized piece of cardboard
- ☐ compass

WEEK 19

- ☐ large piece of cardboard (about 1m squared)
- ☐ black spray paint
- ☐ 8 (or more) ping-pong balls (or other same-sized balls)
- ☐ black permanent marker
- ☐ very strong glue (such as Duco cement)
- ☐ flat piece of glass, such as from a picture frame

WEEK 20

- ☐ cylindrical oatmeal container with plastic lid
- ☐ a nail
- ☐ black tape
- ☐ flashlight

WEEK 21

- ☐ piece of cardboard
- ☐ string
- ☐ 2 thumbtacks
- ☐ pencil

WEEK 22

- ☐ none

WEEK 23

- ☐ none

WEEK 24

- ☐ none

WEEK 25

- ☐ perch dissection kit: <http://www.hometrainingtools.com/perch-dissection-kit> (optional)

WEEK 26

- ☐ none

WEEK 27

- ☐ none

WEEK 28

- ☐ crayfish dissection kit: <http://www.hometrainingtools.com/crayfish-dissection-kit> (optional)

WEEK 29

- ☐ eggs

WEEK 30

- ☐ grasshopper dissection kit: <http://www.hometrainingtools.com/grasshopper-dissection-kit> (optional)

WEEK 31

- ☐ earthworm dissection kit: <http://www.hometrainingtools.com/worm-dissection-kit> (optional)

WEEK 32

- ☐ play dough or modeling clay (see recipe Week 6)

WEEK 33

- ☐ microscope (optional but highly recommended)

WEEK 34

- ☐ frog dissection kit: hometrainingtools.com/frog-dissection-kit (optional)

WEEK 35

- ☐ coffee filter
- ☐ clear glass container
- ☐ sugar
- ☐ cocoa
- ☐ old t-shirt or apron
- ☐ craft supplies (paint, markers, glitter, iron-ons, fabric, etc.)

WEEK 36

- ☐ none

FOUNDATIONS OF SCIENCE

WEEK 1—THE SCIENTIFIC METHOD

Day 1

Learn:

Before starting this week of science, each student should look up each word in a dictionary or online. Write out a short definition for each. Place these vocabulary words and definitions into a notebook.

- ☐ Observation
- ☐ Hypothesis
- ☐ Experiment
- ☐ Prediction
- ☐ Theory
- ☐ Assumption
- ☐ Causality

Hear:

Discuss the following together:

Note: How will you discover the answers to these questions? One way is to sit by a computer and look things up together as you discuss. Before doing so, look up and discuss Proverbs 18:17.

- ☐ All scientific investigation starts with curiosity. What do you think this means? Have you ever been curious about something YHWH made?
- ☐ The process of investigation is called the “scientific method.” What does each word mean?
 1. Observing (gathering facts)
 2. Hypothesizing (suggesting explanations)
 3. Experimenting (testing explanations)
- ☐ What would happen if a scientist could not observe something? How can he prove that what he is observing is true? Look up Deuteronomy 19:15.
- ☐ What is an experiment?
- ☐ What is a prediction? The ability to be accurately tested is a sign of a good prediction. What does this mean?
- ☐ What is “cause and effect”?
- ☐ What is a theory? What is a theory that has successfully been tested repeatedly?
- ☐ As a family, make a chart illustrating the scientific method, which you can hang on your wall.

Day 2

Hear:

- ☐ Watch the 5-minute [video about Newton's First Law of Motion](#).
- ☐ Why did these three scientists become curious?
- ☐ How did they use the Observation step of the scientific method?
- ☐ How did they use the Hypothesis step?
- ☐ How did they use the Experimentation step?
- ☐ How can you see cause and effect in this illustration? Are there any causes or effects that you might not be thinking of?
- ☐ Why do you think this is called a *Law* of motion, and not just a theory?

Day 3

Hear:

Discuss the following together:

- ☐ Look it up:
 - What does it mean to be accurate?
 - What does it mean to be precise?
 - Add these two words to your vocabulary for the week.
- ☐ We call mathematics the “language of science.” Why do you think this is?
- ☐ What is an equation?
- ☐ What is trial and error?
- ☐ What is a measurement? Can you name some things that can be measured? (*Length, volume, mass, time, temperature. Define as needed.*)
- ☐ What are significant figures?
- ☐ What is scientific notation?
- ☐ What is the metric system?

Day 4

Do:

- ☐ You've probably noticed that your tongue can taste many different flavors. (Can you name some?) Do you think you know why?
- ☐ Suggest a hypothesis as to why your tongue can taste different flavors. Write your hypothesis down in a complete sentence.
- ☐ Before doing the following experiment, predict what you think will happen. Write your prediction down in a complete sentence.
- ☐ Experiment: <http://www.scholastic.com/parents/resources/article/science-nature-activities/home-science-experiments-tongue-map>
- ☐ Analyze your results. Was your hypothesis correct? Did your prediction come true? Were the results repeatable? Why or why not?
- ☐ Look at the topic again by visiting this website:
<http://pbskids.org/zoom/activities/sci/tonguemap.html>
- ☐ Could you design a better experiment? What would make it better?
- ☐ You may wish to download a [Science Experiment Record Form](#) from our website.

Day 5

Do:

- ☐ Notebooking – Make a page for your notebook. Be sure to include a paragraph that tells what you learned this week.
- ☐ Research – Have you become more curious about anything in YHWH’s creation this week? Start a page in your notebook where you can list things you’re curious about. Be sure to write things down quickly before you forget them! Choose one topic to look up online or in a book today. Tell your parents what you learned about that topic.
- ☐ High School – Check out a library book on the life of Sir Isaac Newton or Galileo Galilei. Try to have it read within a week. Make a list of 3-5 character qualities in their lives that helped them become excellent scientists. Plan to share the list with your family next week.

FOUNDATIONS OF SCIENCE

WEEK 2—OVER THE FACE OF THE WATERS...

Day 1

Learn:

We're going to learn about waves this week. Before starting, each student should look up the following words in a dictionary or online. Write out a *short* definition for each. Place these vocabulary words and definitions into a notebook.

- ☐ Wave
- ☐ Medium
- ☐ Crest
- ☐ Trough
- ☐ Transverse wave
- ☐ Longitudinal wave
- ☐ Wavelength
- ☐ Amplitude
- ☐ Frequency
- ☐ Speed
- ☐ Reflection
- ☐ Refraction
- ☐ Diffraction
- ☐ Interference

Hear:

Discuss the following together:

- ☐ Read [Genesis 1:1-2](#). What did the Spirit of God hover over?

Soon we're going to learn about the first things God made – sound and light. We'll discover that both of those forms of energy use waves to travel. Do you see that before God created anything, He was “hovering over the face of the waters”? We'll learn more about water later, but this week, let's talk just about waves.

Try this activity:

- ☐ Tie a rope or heavy string to something, and hold the opposite end in your hand. Begin making waves with the rope. Make both large and small waves, fast and slow waves.
- ☐ Tie a knot somewhere in the rope. Now watch the knot as you make waves in the rope. Does the knot actually travel? What does it do?
- ☐ Using the definitions you wrote down for this week's vocabulary words, can you explain the following things on your rope?
 - Wave
 - Medium

- Crest
- Trough
- Transverse wave
- Longitudinal wave
- Wavelength
- Frequency

- ☐ In your notebook, draw a wave and label the *crest*, *trough*, and *wavelength*.
- ☐ Optional: Watch video “[Introduction to Waves](#).”

Day 2

Hear:

- ☐ Watch video “[Amplitude, Period, Frequency and Wavelength of Periodic Waves](#).”
- ☐ Older students: Can you explain this mathematical formula?

$$\text{Speed (velocity)} = \text{wavelength} \times \text{frequency}$$

Day 3

Hear:

Discuss the following together:

- ☐ Watch video “[What Is a Ripple Tank?](#)”
- ☐ Read more about [ripple tanks](#).
- ☐ Can you make a simple ripple tank in your home? (Hint: What kinds of waves could you observe in an ordinary bathtub? Could you add lighting? Visit http://tpt.aapt.org/resource/1/phteah/v50/i1/p17_s1?isAuthorized=no)

Day 4

Do:

- ☐ Here is a fun experiment to do with waves: http://www.eduplace.com/rdg/gen_act/ocean/wave.html
- ☐ Be sure to ***write your predictions down*** before starting the experiment!
- ☐ Could you design a better experiment? What would make it better?

Day 5

Do:

- ☐ Notebooking – Make a page for your notebook. Be sure to include a paragraph that tells what you learned this week.

- ❑ Research – What do you think it means that the Spirit of God hovered over the face of the waters? What happens when a helicopter hovers over water? Look it up, then tell about it in a few paragraphs. Include pictures if they will help explain it. *(Note: Do not copy others' pictures or words. Use your own. If you need to, tell your mother what you want to say, and ask her to write it down for you. Another idea is to speak into a voice recorder on a cell phone, etc.)*
- ❑ High School – Share what you have learned about Sir Isaac Newton or Galileo Galilei.

FOUNDATIONS OF SCIENCE

WEEK 3—AND GOD SAID...

Day 1

Learn:

We're going to learn about waves this week. Before starting, each student should look up the following words in a dictionary or online. Write out a *short* definition for each. Place these vocabulary words and definitions into a notebook.

- ☐ Sound
- ☐ Intensity
- ☐ Loudness
- ☐ Decibel
- ☐ Pitch
- ☐ Audible Sound
- ☐ Infrasonic
- ☐ Ultrasonic
- ☐ Doppler Effect
- ☐ Supersonic
- ☐ Shock Wave
- ☐ Sonic Boom

Hear:

- ☐ Discuss the following together:
 - ☐ Genesis 1:3 says that when YHWH began to create the world, He did it by speaking. (“And God said...”) Since He *spoke* the world into existence, we’re going to study the properties of sound this week.
 - ☐ Read Psalm 33:9 and John 1:1-3. How did God create the world?
 - ☐ What are some other things that God spoke? Read Psalm 105:31, 34; Psalm 107:25; and John 12:48.
- ☐ From the vocabulary words that you defined (above), what do you most wish you could learn about sound this week?

Day 2

Hear:

- ☐ Watch video “[What Is Up with Noises?](#)”
- ☐ Make a page for your notebook that explains how our ears hear sound. Drawing pictures is great!

Day 3

Hear:

Discuss the following together:

- ☐ Learning about musical instruments is a great way to explore sound. Try some of the projects at <http://exploresound.org/musical-instruments-part/>.
- ☐ Older students: Learn more about infrasonic and ultrasonic sounds here: http://www.school-for-champions.com/science/sound_frequencies.htm

Day 4

Do:

- ☐ Try one of the fun sound activities at <http://www.sciencekids.co.nz/sound.html>.

Day 5

Do:

- ☐ Notebooking – Make a page for your notebook. Be sure to include a paragraph that tells what you learned this week.
- ☐ High School Students – Do this unit on the speed of sound: <http://www.physicsclassroom.com/class/sound/u1l12c.cfm>

FOUNDATIONS OF SCIENCE

WEEK 1—THE SCIENTIFIC METHOD

Day 1

Learn:

Look up each word in a dictionary or online. Write out a short definition for each. Try to keep each definition to fewer than 10 words.

We recommend Webster's 1828 *American Dictionary of the English Language*.

<http://webstersdictionary1828.com>

When words are not available in Webster's dictionary, try <http://www.dictionary.com>.

Observation _____

Hypothesis _____

Experiment _____

Prediction _____

Theory _____

Assumption _____

Causality _____

Hear:

Copy Proverbs 18:17 from your Bible.

Hear:

Discuss the following with your teacher:

- ☐ All scientific investigation starts with curiosity. What do you think this means? Have you ever been curious about something YHWH made?
- ☐ The process of investigation is called the “scientific method.” What does each word mean?
 1. Observing (gathering facts)
 2. Hypothesizing (suggesting explanations)
 3. Experimenting (testing explanations)
- ☐ What would happen if a scientist could not observe something? How can he prove that what he is observing is true? Look up Deuteronomy 19:15.
- ☐ What is an experiment?
- ☐ What is a prediction? The ability to be accurately tested is a sign of a good prediction. What does this mean?
- ☐ What is “cause and effect”?
- ☐ What is a theory? What is a theory that has successfully been tested repeatedly?

Make a chart illustrating the scientific method. Be sure to use each of these steps:

1. Observing (gathering facts)
2. Hypothesizing (suggesting explanations)
3. Experimenting (testing explanations)

Day 2

Hear:

Watch the 5-minute video about Newton's First Law of Motion at <https://youtu.be/5-ZFOhHQS68>.

Discuss the following with your teacher:

- ☐ Why did these three scientists become curious?
- ☐ How did they use the Observation step of the scientific method?
- ☐ How did they use the Hypothesis step?
- ☐ How did they use the Experimentation step?
- ☐ How can you see cause and effect in this illustration? Are there any causes or effects that you might not be thinking of?
- ☐ Why do you think this is called a *Law* of motion, and not just a theory?

Day 3

Hear:

Look up each word in a dictionary or online. Write out a short definition for each. Try to keep each definition to fewer than 10 words.

Accurate

Precise

Day 4

Do:

You've probably noticed that your tongue can taste many different flavors. (Can you name some? Draw pictures to illustrate them.) Do you think you know why?

Suggest a hypothesis as to why your tongue can taste different flavors. Write your hypothesis down in a complete sentence.

Before doing the following experiment, predict what you think will happen. Write your prediction down in a complete sentence.

- ☐ Experiment: <http://www.scholastic.com/parents/resources/article/science-nature-activities/home-science-experiments-tongue-map>

Analyze your results. Was your hypothesis correct? Did your prediction come true? Were the results repeatable? Why or why not?

- ☐ Look at the topic again by visiting this website:
<http://pbskids.org/zoom/activities/sci/tonguemap.html>

Could you design a better experiment? What would make it better?

Day 5

Do:

Draw a picture that illustrates something you learned this week about the scientific method. Write a summary paragraph at the bottom of the page.

Things I Want to Learn More About:

Have you become more curious about anything in YHWH's creation this week? On this page, start a list of things you're curious about. When you think of something, be sure to write it down quickly before you forget it!

[illegible]

Choose one topic to look up online or in a book today. Tell your parents what you learned about that topic.

FOUNDATIONS OF SCIENCE

WEEK 2—OVER THE FACE OF THE WATERS...

Day 1

Learn:

Look up each word in a dictionary or online. Write out a short definition for each. Try to keep each definition to fewer than 10 words.

We recommend Webster's 1828 *American Dictionary of the English Language*.

<http://webstersdictionary1828.com>

*When words are not available in Webster's dictionary, try <http://www.dictionary.com>.

We have supplied some definitions for you.

Wave

Medium

Crest*

Trough

Transverse wave*

Longitudinal wave*

Wavelength*

Amplitude

The distance from the rest position to the crest position which is half the vertical distance from a trough to a crest.

Frequency

Speed

Reflection

Refraction

Diffraction*

Interference*

Hear:

Copy Genesis 1:1-2 from your Bible.

Hear:

Discuss the following with your teacher:

- ☐ Read [Genesis 1:1-2](#). What did the Spirit of God hover over?

Soon we're going to learn about the first things God made – sound and light. We'll discover that both of those forms of energy use waves to travel. Do you see that before God created anything, He was "hovering over the face of the waters"? We'll learn more about water later, but this week, let's talk just about waves.

Do:

Try this activity:

- ☐ Tie a rope or heavy string to something, and hold the opposite end in your hand. Begin making waves with the rope. Make both large and small waves, fast and slow waves.
- ☐ Tie a knot somewhere in the rope. Now watch the knot as you make waves in the rope. Does the knot actually travel? What does it do?
- ☐ Using the definitions you wrote down for this week's vocabulary words, can you explain the following things on your rope?
 - Wave
 - Medium
 - Crest

- Trough
- Transverse wave
- Longitudinal wave
- Wavelength
- Frequency

Draw a wave and label the *crest*, *trough*, and *wavelength*.

- ☐ Optional: Watch video “Introduction to Waves” at https://youtu.be/c38H6UKt3_I.

Day 2

Hear:

- ☐ Watch video “[Amplitude, Period, Frequency and Wavelength of Periodic Waves](#).”
- ☐ Older students: Can you explain this mathematical formula?

$$\text{Speed (velocity)} = \text{wavelength} \times \text{frequency}$$

Day 3

Hear:

Discuss the following together:

- ☐ Watch video “What Is a Ripple Tank?” at <https://youtu.be/-8a61G8Hvi0>.
- ☐ Read more about ripple tanks at https://en.wikipedia.org/wiki/Ripple_tank.
- ☐ Can you make a simple ripple tank in your home? (Hint: What kinds of waves could you observe in an ordinary bathtub? Could you add lighting? Visit http://tpt.aapt.org/resource/1/phteah/v50/i1/p17_s1?isAuthorized=no)

Day 4

Do:

- ☐ Here is a fun experiment to do with waves: http://www.eduplace.com/rdg/gen_act/ocean/wave.html
- ☐ Be sure to ***write your predictions down*** before starting the experiment!

Write your hypothesis in a complete sentence.

Before doing the experiment, write your prediction in a complete sentence.

Analyze your results. Was your hypothesis correct? Did your prediction come true? Were the results repeatable? Why or why not?

Could you design a better experiment? What would make it better?

Day 5

Do:

- ☐ Notebooking – Make a page for your notebook. Be sure to include a paragraph that tells what you learned this week. (See next page.)
- ☐ Research – What do you think it means that the Spirit of God hovered over the face of the waters? What happens when a helicopter hovers over water? Look it up, then tell about it in a few paragraphs. Include pictures if they will help explain it. (See page 6.)
 - *(Note: Do not copy others' pictures or words. Use your own. If you need to, tell your mother what you want to say, and ask her to write it down for you. Another idea is to speak into a voice recorder on a cell phone, etc.)*
- ☐ High School – Share what you have learned about Sir Isaac Newton or Galileo Galilei.



About Waves

About Genesis 1:2

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

FOUNDATIONS OF SCIENCE

WEEK 3—AND GOD SAID...

Day 1

Learn:

Look up each word in a dictionary or online. Write out a short definition for each. Try to keep each definition to fewer than 10 words.

We recommend <http://www.dictionary.com> for this week's definitions. If many definitions are given, look for one that has to do with physics or sound waves. We have supplied some definitions for you.

Sound

Intensity

Loudness

Decibel

Audible Sound

Infrasonic

Ultrasonic, ultrasound

Doppler Effect

Supersonic

Shock Wave _____

Sonic Boom _____

Hear:

Copy Genesis 1:3 from your Bible.

Hear:

Discuss the following with your teacher:

- ☐ Genesis 1:3 says that when YHWH began to create the world, He did it by speaking. (“And God said...”) Since He *spoke* the world into existence, we’re going to study the properties of sound this week.

- ☐ Read Psalm 33:9 and John 1:1-3. How did God create the world? _____

- ☐ What are some other things that God spoke? Read Psalm 105:31, 34; Psalm 107:25; and John 12:48.

From the vocabulary words that you defined (above), what do you most wish you could learn about sound this week?

Day 2

Hear:

- ☐ Watch video “[What Is Up with Noises?](http://www.khanacademy.org/embed_video?v=i_0DXxNeaQ0)” at http://www.khanacademy.org/embed_video?v=i_0DXxNeaQ0.
- ☐ Draw a picture that explains how our ears hear sound. Drawing pictures is great!

How Ears Hear Sound



Day 3

Hear:

Discuss the following together:

- ☐ Learning about musical instruments is a great way to explore sound. Try some of the projects at <http://exploresound.org/musical-instruments-part/>. If doing an experiment, use the experiment form on page 6.
- ☐ Older students: Learn more about infrasonic and ultrasonic sounds here: http://www.school-for-champions.com/science/sound_frequencies.htm

Day 4

Do:

- ☐ Try one of the fun sound activities at <http://www.sciencekids.co.nz/sound.html>. If doing an experiment, use the experiment form on page 6.

Write your hypothesis in a complete sentence.

Before doing the experiment, write your prediction in a complete sentence.

Analyze your results. Was your hypothesis correct? Did your prediction come true? Were the results repeatable? Why or why not?

Could you design a better experiment? What would make it better?

Day 5

Do:

- ☐ Notebooking – Make a page for your notebook (see page 7). Be sure to include a paragraph that tells what you learned this week.
- ☐ High School Students – Do this unit on the speed of sound:
<http://www.physicsclassroom.com/class/sound/u1l12c.cfm>



Experiments on Sound

Explain the experiment's procedure. Draw a picture if that is helpful.

Write your hypothesis in a complete sentence.

Before doing the experiment, write your prediction in a complete sentence.

Analyze your results. Was your hypothesis correct? Did your prediction come true? Were the results repeatable? Why or why not?

Could you design a better experiment? What would make it better?



What I Learned about Sound
