Teacher Introduction

Welcome to God's Design® for the Physical World

God's Design for the Physical World is a series that has been designed for use in teaching physical science to elementary and middle school students. It is divided into three books: *Heat and Energy, Machines and Motion,* and *Inventions and Technology.* Each book has 35 lessons including a final project that ties all of the lessons together.

In addition to the lessons, special features in each book include biographical information on interesting people as well as fun facts to make the subject more fun.

Although this is a complete curriculum, the information included here is just a beginning, so please feel free to add to each lesson as you see fit. A resource guide is included in the appendices to help you find additional information and resources. A list of supplies needed is included at the beginning of each lesson, while a master list of all supplies needed for the entire series can be found in the appendices.

Answer keys for all review questions, worksheets, quizzes, and the final exam are included here. Reproducible student worksheets and tests may be found on the supplementary CD-Rom for easy printing. Please contact Answers in Genesis if you wish to purchase a printed version of all the student materials, or go to www.AnswersBookstore.com.

If you wish to get through the Physical World series in one year, you should plan on covering approximately three lessons per week. The time required for each lesson varies depending on how much additional information you want to include, but you can plan on about 45 minutes per lesson.

If you wish to cover the material in more depth, you may add additional information and take a longer period of time to cover all the material or you could choose to do only one or two of the books in the series as a unit study.

Why Teach Physical Science?

Maybe you hate science or you just hate teaching it. Maybe you love science but don't quite know how to teach it to your children. Maybe science just doesn't seem as important as some of those other subjects you need to teach. Maybe you need a little motivation. If any of these descriptions fits you, then please consider the following.

It is not uncommon to question the need to teach your kids hands-on science in elementary school. We could argue that the knowledge gained in science will be needed later in life in order for your children to be more productive and well-rounded adults. We could argue that teaching your children science also teaches them logical and inductive thinking and reasoning skills, which are tools they will need to be more successful. We could argue that science is a necessity in this technological world in which we live. While all of these arguments are true, not one of them is the real reason that we should teach our children science. The most important reason to teach science in elementary school is to give your children an understanding that God is our Creator, and the Bible can be trusted. Teaching science from a creation perspective is one of the best ways to reinforce your children's faith in God and to help them counter the evolutionary propaganda they face every day.

God is the Master Creator of everything. His handiwork is all around us. Our Great Creator put in place all of the laws of physics, biology, and chemistry. These laws were put here for us to see His wisdom and power. In science, we see the hand of God at work more than in any other subject. Romans 1:20 says, "For since the creation of the world His invisible attributes are clearly seen, being understood by the things that are made, even His eternal power and Godhead, so that they [men] are without excuse." We need to help our children see God as Creator of the world around them so they will be able to recognize God and follow Him.

The study of physical science helps us to understand and appreciate the amazing way everything God created works together. The study of energy helps us understand that God set up the universe with enough energy to sustain life and that He created the sun to replenish the energy used up each day. The study of friction and movement helps us appreciate the laws of motion and helps us understand how simple machines can be used to do big things. And finally, studying inventions and technology will not only help us understand the technological world in which we live, but will help us realize that God created man to be creative just like Him.

It's fun to teach physics. It's interesting too. Energy and motion are all around us. We use technology and inventions every day. Finally, teaching physics is easy. You won't have to try to find strange materials for experiments or do dangerous things to learn about physics. Physics is as close as your child's toy box or the telephone—it's the rainbow in the sky and it's the light bulb in the lamp. So enjoy your study of the physical world.

How Do I Teach Science?

In order to teach any subject, you need to understand that people learn in different ways. Most people, and children in particular, have a dominant or preferred learning style in which they absorb and retain information more easily.

If a student's dominant style is:

Auditory He needs not only to hear the information but he needs to hear himself say it. This child needs oral presentation as well as oral drill and repetition.
Visual She needs things she can see. This child responds well to flashcards, pictures, charts, models, etc.
Kinesthetic He needs active participation. This child remembers best through games, hands-on activities, experiments, and field trips.

Also, some people are more relational while others are more analytical. The relational student needs to know why this subject is important and how it will affect him personally. The analytical student, however, wants just the facts.

If you are trying to teach more than one student, you will probably have to deal with more than one learning style. Therefore, you need to present your lessons in several different ways so that each student can grasp and retain the information.

Grades 3–8

Each lesson should be completed by all upper elementary and junior high students. This is the main part of the lesson containing a reading section, a hands-on activity that reinforces the ideas in the reading section (blue box), and a review section that provides review questions and application questions (red box).

Grades 6–8

For middle school/junior high age students, we provide a "Challenge" section that contains more challenging material as well as additional activities and projects for older students (green box).

We have included periodic biographies to help your students appreciate the great men and women who have gone before us in the field of science.

We suggest a threefold approach to each lesson:

Introduce the topic

We give a brief description of the facts. Frequently you will want to add more information than the essentials given in this book. In addition to reading this section aloud, you may wish to do one or more of the following:

- Read a related book with your students.
- Write things down to help your visual students.
- Give some history of the subject. We provide some historical sketches to help you, but you may want to add more.
- Ask questions to get your students thinking about the subject.
- The "FUN FACT" section adds fun or interesting information.

Make observations and do experiments

- Hands-on projects are suggested for each lesson. This section of each lesson may require help from the teacher.
- Have your students perform the activity by themselves whenever possible.

Review

- The "What did we learn?" section has review questions.
- The "Taking it further" section encourages students to
  - Draw conclusions
  - Make applications of what was learned
  - Add extended information to what was covered in the lesson

By teaching all three parts of the lesson, you will be presenting the material in a way that all learning styles can both relate to and remember.

Also, this approach relates directly to the scientific method and will help your students think more scientifically. The *scientific method* is just a way to examine a subject logically and learn from it. Briefly, the steps of the scientific method are:

1. Learn about a topic.
2. Ask a question.
3. Make a hypothesis (a good guess).
4. Design an experiment to test your hypothesis.
5. Observe the experiment and collect data.
6. Draw conclusions. (Does the data support your hypothesis?)

Note: It's okay to have a "wrong hypothesis." That's how we learn. Be sure to help your students understand why they sometimes get a different result than expected.

Our lessons will help your students begin to approach problems in a logical, scientific way.

How Do I Teach Creation vs. Evolution?

We are constantly bombarded by evolutionary ideas about the earth in books, movies, museums, and even commercials. These raise many questions: Do physical processes support evolutionary theories? Do physical laws support an old earth? Do changes in the magnetic field support an old earth? The Bible answers these questions, and this book accepts the historical accuracy of the Bible as written. We believe this is the only way we can teach our children to trust that everything God says is true.

There are five common views of the origins of life and the age of the earth:

Historical biblical account	Progressive creation	Gap theory	Theistic evolution	Naturalistic evolution
Each day of creation in Genesis is a normal day of about 24 hours in length, in which God created everything that exists. The earth is only thousands of years old, as determined by the genealogies in the Bible.	The idea that God created various creatures to replace other creatures that died out over millions of years. Each of the days in Genesis represents a long period of time (day-age view) and the earth is billions of years old.	The idea that there was a long, long time between what happened in Genesis 1:1 and what happened in Genesis 1:2. During this time, the "fossil record" was supposed to have formed, and millions of years of earth history supposedly passed.	The idea that God used the process of evolution over millions of years (involving struggle and death) to bring about what we see today.	The view that there is no God and evolution of all life forms happened by purely naturalistic processes over billions of years. Ken Ham et al., *The Answers Book*, (El Cajon: Master Books, 2000), 33–76.

Any theory that tries to combine the evolutionary time frame with creation presupposes that death entered the world before Adam sinned, which contradicts what God has said in His Word. The view that the earth (and its "fossil record") is hundreds of millions of years old damages the gospel message. God's completed creation was "very good" at the end of the sixth day (Genesis 1:31). Death entered this perfect paradise *after* Adam disobeyed God's command. It was the punishment for Adam's sin (Genesis 2:16–17; 3:19; Romans 5:12–19). Thorns appeared when God cursed the ground because of Adam's sin (Genesis 3:18).

The first animal death occurred when God killed at least one animal, shedding its blood, to make clothes for Adam and Eve (Genesis 3:21). If the earth's "fossil record" (filled with death, disease, and thorns) formed over millions of years before Adam appeared (and before he sinned), then death no longer would be the penalty for sin. Death, the "last enemy" (1 Corinthians 15:26), diseases (such as cancer), and thorns would instead be part of the original creation that God labeled "very good." No, it is clear that the "fossil record" formed sometime *after* Adam sinned—not many millions of years before. Most fossils were formed as a result of the worldwide Genesis Flood.

When viewed from a biblical perspective, the scientific evidence clearly supports a recent creation by God, and not naturalistic evolution and millions of years. The volume of evidence supporting the biblical creation account is substantial and cannot be adequately covered in this book. If you would like more information on this topic, please see the resource guide in the appendices To help get you started, just a few examples of evidence supporting biblical creation are given below:

Evolutionary Myth: Physical processes support evolution.

The Truth: Much of what scientists observe directly contradicts the ideas of evolution. Certain physical properties have been observed and tested to the point that they have been declared to be physical laws. The first law of thermodynamics states that matter and energy cannot be created or destroyed; they can only change form. There is no mechanism in nature for creating either energy or matter. Therefore, evolutionists cannot explain how all of the matter and energy in the universe came to be. This is a topic most evolutionists tend to ignore. The Bible tells us that God created it all and set it in motion.

The second law of thermodynamics states that all systems move toward a state of maximum entropy. This means that everything moves toward total disorganization and equilibrium. Heat moves from an area of higher temperature to an area of lower temperature, and organized systems become disorganized. For example, an organized system of cells that makes up a living creature quickly becomes disorganized when that creature dies. A house left to itself will eventually crumble into dust. Everything around us says that without intervention, chaos and disorganization result. Evolutionists, however, believe that by accident, simple molecules and simple organisms combined to form more complex molecules and organisms. This flies in the face of the second law of thermodynamics and everything that is observed to happen naturally. The changes required for the formation of the universe, the planet earth and life, all from disorder, run counter to the physical laws we see at work today. There is no known mechanism to harness the raw energy of the universe and generate the specified complexity we see all around us.[1]

A third physical property that contradicts evolution is the small amount of helium in the atmosphere. Helium is naturally generated by the radioactive decay of elements in the earth's crust. Because helium is so light, it quickly moves up through the rocks and into the atmosphere. Helium is entering the atmosphere at about 13 million atoms per square inch per second (67 grams/second). Some helium atoms are also escaping the atmosphere into space, but the amount of helium escaping into space is only about 1/40th the amount entering the atmosphere. So, the overall amount of helium in the atmosphere is continually increasing. If you assume that helium cannot enter the atmosphere any other way, which is a reasonable assumption, then the amount of helium in the atmosphere indicates that the earth could be no more than two million years old, which is much less than the billions of years needed for evolution. This is a maximum age—the actual age could be much less since this calculation assumes that the original atmosphere had no helium whatsoever. Also, helium could have been released at a much greater rate during the time after the Genesis Flood. Therefore, the amount of helium in the atmosphere indicates a much younger earth than evolutionists claim.[2]

[1] John D. Morris, Ph.D., *The Young earth*, (Colorado Springs: Creation Life Publishers, 1994), 43. See also www.answersingenesis.org/go/thermodynamics.

[2] Ibid., p. 83–85. See also www.answersingenesis.org/go/helium.

Evolutionary Myth: Changes in the earth's magnetic field indicate an earth that is billions of years old.

The Truth: Most scientists agree on some fundamental facts concerning the earth's magnetic field. The earth is a giant electromagnet. The earth is surrounded by a magnetic field that is believed to be generated by current flowing through the interior of the earth. And there is evidence that the magnetic field of the earth has reversed several times. Also, nearly everyone agrees that the magnetic field is decreasing. The disagreement between evolutionists and creationists concerns how long it takes for the earth's magnetic field to change and what caused or causes the changes. Evolutionists believe that the magnetic field slowly decreases over time, reverses, and then slowly increases again. There are some serious problems with this idea. First, when the magnetic field is very low the earth would have no protection from very harmful radiation from the sun. This would be detrimental to life on earth. Second, at the current rate of decay, the magnetic field of the earth would lose half its energy about every 1,460 years. If the rate of decay is constant, the magnetic field would have been so strong only 20,000 years ago that it would have caused massive heating in the earth's crust and would have killed all life on earth. This supports the idea of an earth that is only about 6,000 years old, as taught in the Bible.

Creationists believe that the magnetic field reversals happened very quickly, and that the decay rate is fairly constant. One study of a lava flow indicated that reversals occurred in only 15 days. Thus, the reversals likely happened as a result of the Genesis Flood when the tectonic plates were moving and the earth's crust was in upheaval.[3]

[3] Ibid., p. 74–83.

Despite the claims of many scientists, if you examine the evidence objectively, it is obvious that evolution and millions of years have not been proven. You can be confident that if you teach that what the Bible says is true, you won't go wrong. Instill in your student a confidence in the truth of the Bible in all areas. If scientific thought seems to contradict the Bible, realize that scientists often make mistakes, but God does not lie. At one time scientists believed that the earth was the center of the universe, that living things could spring from non-living things, and that blood-letting was good for the body. All of these were believed to be scientific facts but have since been disproved, but the Word of God remains true. If we use modern "science" to interpret the Bible, what will happen to our faith in God's Word when scientists change their theories yet again?

Integrating the Seven C's into Your Curriculum

Throughout the *God's Design® for Science* series you will see icons that represent the Seven C's of History. The Seven C's is a framework in which all of history, and the future to come, can be placed. As we go through our daily routines we may not understand how the details of life connect with the truth that we find in the Bible. This is also the case for students. When discussing the importance of the Bible you may find yourself telling students that the Bible is relevant in everyday activities. But how do we help the younger generation see that? The Seven C's are intended to help.

The Seven C's can be used to develop a biblical worldview in students, young or old. Much more than entertaining stories and religious teachings, the Bible has real connections to our

Heat & Energy

Unit 1

Forms of Energy

LESSON 1

Forms of Energy

It works!

Supply list

Copy of "Energy Conversion" worksheet

Supplies for Challenge: Copy of "Energy Chains" worksheet

Energy Conversion worksheet

Initial energy type	Object	Final energy type
Chemical	Battery	Electrical
Electrical or Chemical (gas)	Stove	**Heat**
Electrical	Mixer	**Mechanical**
Electrical	Radio	**Sound**
Electrical	Light bulb	**Light and Heat**
Sound/Electrical	Telephone	**Electrical/Sound**
Chemical or Electrical	Car engine	**Mechanical**
Mechanical	Piano	**Sound**
Electrical	Motor	**Mechanical**
Chemical or Mechanical	Generator	**Magnetic/Electrical**
Electrical	Curling iron	**Heat**
Electrical	Vacuum cleaner	**Mechanical**
Chemical	Human body	**Heat and Mechanical**
Mechanical	Computer keyboard	**Electrical**

What did we learn?

- What is the scientific definition of energy? **The ability to do work.**
- What are some of the types of energy recognized by scientists? **Mechanical, chemical, nuclear, thermal, electrical, sound, light, gravitational, kinetic, and potential.**
- Which types of energy can be converted into other types of energy? **Pretty much all forms can be converted to other forms, although it is unlikely to convert most forms of energy into nuclear energy.**

Taking it further

- Which types of energy are defined by the energy in the atoms or parts of atoms? **Chemical, nuclear, thermal, and electrical.**
- Which types of energy can travel through space? **Electromagnetic waves, which include light and infrared radiation.**
- If the sound of a solar flare were loud enough, could we hear it on earth? **No, sound cannot travel through outer space.**
- What is the final form of almost all energy? **Most energy becomes either heat or light. Each is a form that cannot be easily reused for other purposes, so it is considered lost.**
- If most energy ends up lost, how do we keep everything working on earth? **The sun is continually providing more energy to earth. But on a universal scale, the amount of usable energy in the universe is decreasing every day. This shows that the universe had a beginning—God created it.**

Challenge: Energy Chains worksheet

Accept pictures or diagrams that illustrate the following:

- Coal-powered power plant: **All energy on earth begins with the sun and with the creation of the earth itself by God. The sun provided light energy for plants, which converted it to chemical energy. The plants were converted into coal, mostly as a result of the Genesis Flood. The coal is burned, converting chemical energy into heat energy. The heat turns water into steam, which turns turbines; thus, the heat is converted into mechanical energy. The mechanical energy is used to generate a magnetic field which in turn generates electricity, which goes to houses and other buildings where it is used as light, heat, sound or mechanical energy.**
- Bicycle: **The sun provides energy for plants to grow which are then eaten by you. Your body then converts the chemical energy in the food into electrical and mechanical energy in your muscles to push on the pedals and then becomes kinetic energy as the chain drives the wheel. Sound energy and heat are also released as the tires contact the ground.**

LESSON 2

Mechanical Energy

Making it move

Supply list

Copy of windmill pattern (student manual, p. 14) Two pennies Soda straws Straight pins
Supplies for Challenge: Marble Cardboard or wood Ruler or yard stick
Copy of "Potential Energy" worksheet

Observing Mechanical Energy

- Did the penny have mechanical energy as it was falling? **Yes.**
- Did the penny have mechanical energy before it fell? **Yes, it had gravitational potential energy.**
- How did the penny get the potential energy? **You gave the penny potential energy by picking it up and placing it on the table.**
- What happened when the pennies collided? **The first penny slowed down and the second penny gained speed.**

- Explain where the mechanical energy came from and where it went. **Mechanical energy was transferred from your hand to the first penny. Then some of that energy was transferred to the second penny when it was struck by the first one. Eventually, they both stopped because the energy was transferred into heat (and a little bit of sound) due to friction with the table.**

What did we learn?

- What is mechanical energy? **The energy of moving objects or objects that have the potential to move.**
- What are the two forms of mechanical energy? **Kinetic and potential.**
- What are some forces in nature that possess mechanical energy? **Wind, waves, volcanoes, animals, any object that is higher than the ground level, and anything that is moving.**

Taking it further

- Which has more potential energy, a book on the floor or a book on a table? **The book on the table has the potential to move if the table is removed, so it has more potential energy.**
- List at least three ways that machines designed by humans use mechanical energy to make your life easier. **Power tools, electric can openers, electric pencil sharpeners, cars, planes, trains, etc.**
- When does a roller coaster have the most and the least potential energy? **It has the most gravitational potential energy at the top of the highest hill and the least at the bottom of the lowest dip.**
- Give another example of potential energy being converted into kinetic energy. **A skier skiing downhill, a paratrooper jumping from an airplane, an airplane landing, or pretty much anything moving down with respect to the earth.**

Challenge: Potential Energy worksheet

- From which height did the marble roll the farthest? **It should have been from the highest ramp.**
- Why did it roll farther from a higher ramp? **The higher the marble is when it starts its descent, the more potential energy it has, so the farther it will roll before it stops.**
- What did you notice about the speed of the marble as it reached the bottom of the 3 inch ramp compared to the speed of the marble at the bottom of the 1 inch ramp? **The marble rolled from the higher ramp rolled faster.**
- Explain this difference. **The energy is released faster, so the marble accelerates faster and reaches a higher speed.**

LESSON 3

Chemical Energy

What did you eat today?

Supply list

Copy of "Chemical Energy Scavenger Hunt"
Supplies for Challenge: Research materials on biofuels

What did we learn?

- What is chemical energy? **Energy that is stored in the bonds of molecules.**

- What two complementary processes were designed by God to change the sun's energy into energy for all living things? **Photosynthesis and digestion/cellular respiration.**
- Name two fossil fuels. **Petroleum/oil, coal, and natural gas are the fossil fuels.**
- Other than digestion, what is the most common way to release chemical energy? **Through combustion or burning of fuels.**

Taking it further

- Name two non-fossil fuels used in some automobiles and explain why they are chemical forms of energy. **Combustion is a chemical process, and hydrogen fuel cells burn hydrogen instead of gasoline. Electric cars use batteries that produce electricity by a chemical reaction inside the battery. Biodiesel and ethanol are also used as alternative fuels in some vehicles. These fuels are used in combustion so they are also chemical energy.**
- Why are people looking for alternatives to fossil fuels? **Fossil fuels are considered non-renewable. We may eventually use them up, so alternative sources may be needed.**
- Describe one way that chemical energy is used to produce electrical energy on a large scale? **Many power plants burn coal, oil, or natural gas to produce the steam that turns the turbines to generate electricity. Batteries also produce electricity via a chemical reaction, but not on a large scale.**

LESSON 4

Nuclear Energy

Using atoms

Supply list

Modeling clay

Supplies for Challenge: Research materials on uses of radiation

What did we learn?

- What is nuclear power? **Energy that is released when the nucleus of an atom is changed.**
- What is nuclear fission? **A nucleus splits apart after being hit by a speeding neutron.**
- What is nuclear fusion? **When a new nucleus is formed by the fusing of two or more smaller nuclei or nuclear particles such as protons and neutrons.**
- Which nuclear process is used in nuclear power plants? **Fission.**

Taking it further

- Why is this process used in nuclear power plants? **Fusion only occurs at very high temperatures and fission is more easily controlled.**
- Why are some submarines built with nuclear power plants instead of diesel engines? **A nuclear power plant is more efficient, quieter, and requires less fuel.**
- How might nuclear waste be safely stored? **Most nuclear waste is stored in underground caves in remote areas. Thick lead containers are used for temporary storage.**

Master Supply List

The following table lists all the supplies used for *God's Design for the Physical World* activities. You will need to look up the individual lessons in the student book to obtain the specific details for the individual activities (such as quantity, color, etc.). The letter *c* denotes that the lesson number refers to the challenge activity. Common supplies such as colored pencils, construction paper, markers, scissors, tape, etc., are not listed.

Supplies needed (see lessons for details)	Heat	Machines	Inventions
Aluminum foil	10, 12, 14, 18, 30		8, 32
Bag (mesh)			25
Bag (plastic)			25
Balloons	11, 12, 24	23	14
Batteries (2 D cells)	14c, 15, 16, 17, 20, 21c		
Battery (6-volt)			4
BBs (steel)	18		31
Beads (large and small glass or plastic)		4c	
Bible	35	35	35
Bicycle		14	
Bolts			10c
Box (small)	10c, 27, 33	7, 12	
Broom		16	
Bucket		25c	26c
Calculator	24c	4c, 24c	
Camera (optional)	34		
Candle-making supplies (optional)	28		
Canning jar rings		26	
Cans		4c	
Cardboard tubes (paper towel rolls)	24, 26, 33		
Cloth			24
Coins (pennies, nickels)	2, 14, 18	21	9
Colander/strainer	10		
Colored filters or colored plastic wrap	29c		3c, 5
Comb (plastic)	12		
Compass (illustration)		2	
Compass (navigational)	19, 20c	18	29
Craft sticks			9, 19
Cup hook		6	
Cups (paper or foam)		27	3
Dominoes		4	
Eggs (hard-boiled and raw)		21c, 25	

Supplies needed (see lessons for details)	Heat	Machines	Inventions
File (metal)			4
Flashlights	14, 15, 16, 28, 29, 30, 32		3, 5, 32
Flour			18
Food coloring	8		
Funnel	25		
Gallon jug		16	
Golf ball		4, 25	
Gyroscope (optional)		27	
Hammer		22	
Ink pad			1
Iron filings	17		
Jars	12, 27		
Ketchup packets or other condiments packets			20
Lenses	33c		
Life Savers candies	13		
Magnets	17, 18, 19, 21		9, 29
Magnifying glass	33		6c
Marbles	2c	4, 25c, 26	31
Masking tape		18, 19, 22, 26, 30	
Milk	32c		
Milk carton (½-gallon)			26c
Mirror (hand)	29, 30, 31		
Modeling clay	4, 12, 30c	5	3, 4, 16, 19, 26, 33
Nails (iron)	18, 20		
Needle (sewing)	19		24
Notebook			34
Nuts or washers		30	26
Oranges			28, 30
Oven mitts			8, 10
Paint (black)	10c		
Paper clips	12, 17, 18, 20		3
Ping pong ball		4, 25	
Plastic bottle (2-liter, empty)	25c		20, 26
Plate (foam or paper)			16
Playing card		21	
Popcorn (unpopped)			18
Poster board/cardboard/tagboard	2, 14, 19, 27, 30, 31	11, 15, 19, 25c, 26c	9, 10, 14, 16, 32
Potatoes			1
Prism (optional)	29		

Supplies needed (see lessons for details)	Heat	Machines	Inventions
Protractor	30c		
Pulleys (optional)		16, 34	
Radio or CD player	22		4
Rice (uncooked)			18
Rollerskates or inline skates		22, 23	
Rope	22	5, 16	
Rubber bands	25, 27	2, 6, 10, 14c	23
Rubber stamps			1
Rubbing alcohol			23
Salt	32c		
Sandpaper		6	
Scale (bathroom)		5c, 7c	
Screwdriver		11c	
Screws (with various threads)		11c	
Sewing machine			24
Shoebox lid		25c	
Sidewalk chalk		18	
Slinky® (metal)	22c	29	
Sponge	19		
Spring scale (optional)		6, 10, 14c	
Stopwatch	24c	18, 19, 30	26
Straight pins	2, 30c	15	
Straws	2, 27		9, 14, 16, 26
String	26	1, 5, 26, 27, 28, 30	3, 4, 8, 14, 25, 26
String instrument (optional)	26		
Stuffed animal		17	
Tack or push pin		26c	
Tennis ball		1, 21, 25, 28	
Tennis racquet or baseball bat		1	
Thermometer	6, 7, 9, 10		
Thermos (optional)	9c		
Thread (spools)		4c, 5	19, 24
Timer (with beep)	24		
Toothpicks		31	16c
Tracing paper	22, 33		
Train (toy)			9
Tubing (clear plastic)	25		3, 31
TV remote control (optional)			5
Tweezers			30
Vegetable oil	6c, 32c		

Supplies needed (see lessons for details)	Heat	Machines	Inventions
Wagon or cart		17, 21	
Wire (copper)	14, 15, 16, 17, 20		4
Wood (for making a ramp)		3, 10, 19, 26	
Wood (block)	2, 18	6, 11c, 12, 14, 31	17
Yard stick/meter stick and ruler	2, 18, 19, 25, 29, 30	2, 4c, 6, 7c, 11, 12, 18, 19, 26	6c, 17