

long-term or short-term. If a long-term experiment is coming up, you will be notified of it with a note that is set off in a yellow box. It will warn you to look ahead at the upcoming long-term experiment, and it will tell you when that experiment needs to be started. Thus, you need not read ahead in the book. Everything you need to know will be presented as you need to know it.

***** **Please Do The Experiments With Common Sense And Adult Supervision.** *****

You will not find these experiments to be any more dangerous than cooking or cleaning, but that doesn't mean children can't get hurt. Supervise your children and coach them that oven burners, open flames, and electricity should be treated with care, and unless you are specifically instructed in the book to do so, you should *never* eat or drink anything that comes from an experiment!

Experiment Supplies

The experiments use only common household items, but of course, some items are more “common” than others. Here is a list of the things that are a bit unusual and might take some time to find. The supplies listed in red are used for the challenge lessons. If you are not doing those lessons, you don't have to worry about those supplies.

Materials That Might Take Some Time to Acquire

For the first set of lessons (Lessons 1-15):

- 👉 Hydrogen peroxide (It is sold in drug stores to clean wounds.)
- 👉 Steel wool
- 👉 Yeast
- 👉 A compass
- 👉 Bare copper wire (16 – 18 gauge works best. You can buy this in the jewelry-making part of a craft store or in a hardware store.)
- 👉 2-4 strong, circular magnets (They are often called “neodymium magnets.” Craft stores sell them as “craft magnets.” Most packages hold several, even though you might see only two or three when you look at the package. See the photo on page 43 to get an idea of how big they should be.)

For the second set of lessons (Lessons 16-30):

- 👉 A bar magnet or a horseshoe magnet (Both would be ideal, but you need at least one of them. If you don't know what they are, look at the drawings on page 48.)
- 👉 Rubbing alcohol
- 👉 **A copper pipe that is at least 15 centimeters (6 inches) long and big enough for the magnets from the first set of lessons to fit comfortably inside the pipe (For the best effect, the pipe should be only a bit wider than the magnets. You want the magnets to be able to travel through the pipe, but you want the edges of the pipe close to the magnets.)**

For the third set of lessons (Lessons 31-45):

- 👉 Meat tenderizer (Adolph's and McCormick are two popular brands.)

For the fourth set of lessons (Lessons 46-60):

- 👉 **Tonic water**

- ✎ Turmeric (This is a spice. Don't use turmeric supplements, because they are expensive and have other things in them. If you don't already have it, get a small bottle from the spice section of any supermarket.)

For the fifth set of lessons (Lessons 61-75):

- ✎ An LED flashlight (If you don't have an LED flashlight, use an uncovered lamp with an incandescent bulb.)
- ✎ Clear nail polish
- ✎ Speakers for a computer (Any speakers that have a plug similar to the one pictured on page 221 will work.)

For the sixth set of lessons (Lessons 76-90):

- ✎ Epsom salt (Sold in any drug store and in the pharmacy section of most large supermarkets. Its chemical name is magnesium sulfate.)
- ✎ A string of LED Christmas lights (not necessary, as there is an internet video you can watch)

Here is a list of everything you need to do the experiments, separated by the time frame that is being studied. Remember that each time frame is six weeks' worth of lessons, so making sure you have everything for a given time frame ensures that you have six weeks of science supplies ready. Note that the things listed previously are also contained in the list below. In addition, the materials for the challenge lessons are in red.

Supplies for Science in the Early 19th Century (Lessons 1-15)

- ✎ A metal sewing needle (It should be pretty lightweight. Don't use a really big one.)
- ✎ Scissors
- ✎ Thread
- ✎ At least two different magnets (One of them should be strong.)
- ✎ A vertical, metal surface on which you can stick the magnets (Such as a refrigerator door or a metal filing cabinet.)
- ✎ Steel wool (You need only two small clumps of it.)
- ✎ Hydrogen peroxide (It is sold in drug stores to clean wounds.)
- ✎ A ¼-cup measuring cup
- ✎ A wooden or plastic spoon
- ✎ Hydrogen peroxide
- ✎ White vinegar
- ✎ Baking soda
- ✎ Yeast
- ✎ A ¼ measuring teaspoon
- ✎ Four small glasses, like juice glasses (Two of them need to be transparent.)
- ✎ A treat the student really likes
- ✎ A plastic bag
- ✎ Two balloons of the same size and shape (6-inch to 9-inch round balloons are ideal.)
- ✎ A 2-liter bottle
- ✎ A funnel
- ✎ An index card
- ✎ A measuring cup (preferably with a pouring spout)

- ✎ A measuring tablespoon
- ✎ A sink
- ✎ Salt
- ✎ Water
- ✎ Ice
- ✎ A marker or crayon
- ✎ A tablespoon
- ✎ Three metal cans, like the kind soup comes in
- ✎ A large plastic freezer bag, like a gallon-sized Ziploc bag
- ✎ A bowl that is big enough to hold one of the metal cans listed above but small enough to fit in the plastic freezer bag listed above
- ✎ A freezer that has room for all three cans
- ✎ A dishcloth
- ✎ At least 7 quarters and 7 nickels (If you do not have U.S. currency, use two coins that are quite different in size.)
- ✎ A paperclip
- ✎ A 3-ring binder
- ✎ String
- ✎ Cellophane tape
- ✎ A ruler
- ✎ A brown paper bag
- ✎ A potato
- ✎ Cheese (any kind)
- ✎ Butter
- ✎ A knife
- ✎ A large plate
- ✎ A window
- ✎ A pencil
- ✎ A battery (either a D or C cell)
- ✎ Some Play-Doh or modelling clay
- ✎ Aluminum foil (For one of the experiments, heavy-duty foil works best.)
- ✎ A compass
- ✎ Two clean, shiny pennies minted in 2010 or later (Any post-1982 penny should work, but the ones made in 2010 or after seem to work the best.)
- ✎ Vinegar
- ✎ A candle that can sit on its own or is in a holder
- ✎ Something to light the candle
- ✎ Two glasses that are a bit taller than the candle
- ✎ A teaspoon
- ✎ A towel
- ✎ A flat counter (not made of anything flammable)
- ✎ A pie pan or similar shallow pan that can hold some water
- ✎ A 9-volt battery
- ✎ Pliers
- ✎ Wire cutters or strong scissors
- ✎ Bare copper wire (16 – 18 gauge works best. You can buy this in the jewelry-making part of a craft store or in a hardware store.)

- ✎ 2-4 strong, circular magnets (They are often called “neodymium magnets.” Craft stores sell them as “craft magnets.” Most packages hold several, even though you might see only two or three when you look at the package. See the photo on page 43 to get an idea of how big they should be.)
- ✎ A tall, thin glass (Ideally, it should be tapered at the bottom.)
- ✎ A plastic fork
- ✎ Two wooden toothpicks
- ✎ Two eggs
- ✎ Rubbing alcohol
- ✎ Two bowls
- ✎ A fork
- ✎ Two plates
- ✎ A few leaves of red (sometimes called “purple”) cabbage
- ✎ Ammonia (sold in supermarkets with the cleaning supplies)
- ✎ Two white pieces of paper, such as writing paper without lines, napkins, or paper towels
- ✎ Three metal forks that are the same size, shape, and weight

Supplies for Science in the Early-to-Mid 19th Century I (Lessons 16-30)

- ✎ Steel wool
- ✎ Scissors
- ✎ A bar magnet or a horseshoe magnet (Both would be ideal, but you need at least one of them. If you don’t know what they are, look at the drawings on page 48.)
- ✎ A magnet that isn’t a bar or horseshoe, like the round ones used in the previous experiment
- ✎ A blank sheet of white paper for each type of magnet you have
- ✎ Rubber or latex gloves, like the ones used for cleaning
- ✎ A small plastic trash bag or grocery bag that can be thrown away
- ✎ A radio (the smaller the better)
- ✎ A fork
- ✎ Paper towels
- ✎ Bare copper wire like you used in the experiment for Lesson 15
- ✎ Two nails
- ✎ A C-cell or D-cell battery
- ✎ Kitchen tongs
- ✎ Cellophane tape
- ✎ A metal paper clip
- ✎ Aluminum foil
- ✎ Seven Styrofoam cups
- ✎ Water
- ✎ A pot for boiling (Ideally, it should have a pour spout on it.)
- ✎ Two tall glasses
- ✎ A stove
- ✎ Ice cubes
- ✎ Food coloring (A dark color is best.)
- ✎ Two 2-liter plastic bottles, like the kind soda comes in
- ✎ Four sheets of 8.5 inch x 11 inch paper, all the same color
- ✎ A pencil with an eraser
- ✎ A pin, preferably with a tiny ball as its head

- 👉 Salt
- 👉 A round balloon with a diameter of at least 20 centimeters (8 inches)
- 👉 A funnel
- 👉 A hammer
- 👉 An empty soup can (or any metal can of similar size)
- 👉 A large screwdriver
- 👉 A sheet of construction paper
- 👉 Several marbles
- 👉 Two quarters (If you don't live in the U.S., use two fairly large coins.)
- 👉 Milk
- 👉 White Vinegar
- 👉 A ½-cup measuring cup
- 👉 A teaspoon
- 👉 Three small glasses, like juice glasses
- 👉 Plastic wrap
- 👉 A sink
- 👉 Red (sometimes called purple) cabbage
- 👉 Ammonia
- 👉 A glass baking dish or shallow bowl that is wider than the two Styrofoam cups placed side by side
- 👉 Rubbing alcohol (If you don't have that, hydrogen peroxide will work.)
- 👉 A ¼-teaspoon measuring spoon
- 👉 A flashlight
- 👉 Construction paper (black is best)
- 👉 A D-cell or C-cell battery
- 👉 A flashlight (not one that uses LEDs or fluorescent lights)
- 👉 A sheet of cardboard that is about 22 cm x 28 cm (8.5 inches by 11 inches)
- 👉 Play-Doh or modeling clay
- 👉 A room that can be made dim
- 👉 The same 2-4 small, circular magnets you used in the previous section
- 👉 A copper pipe that is at least 15 centimeters (6 inches) long and big enough for the magnets from the first set of lessons to fit comfortably inside the pipe (For the best effect, the pipe should be only a bit wider than the magnets. You want the magnets to be able to travel through the pipe, but you want the edges of the pipe close to the magnets.)
- 👉 A small rock or marble that will also fit comfortably inside the pipe
- 👉 A metal thumbtack
- 👉 A rubber band that is at least half as wide as the paper clip
- 👉 Two jars or soup cans that are full
- 👉 A thin sheet of cardboard (like the back of a pad of paper)
- 👉 A 9-volt battery

Supplies for Science in the Early-to-Mid 19th Century II (Lessons 31-45)

- 👉 A metal hanger
- 👉 String or yarn (about 2 meters, or 6 feet)
- 👉 Scissors
- 👉 Two eggs

- ✎ Four small glass bowls or small glasses (They each need to hold only half an egg.)
- ✎ Meat tenderizer (Adolph's and McCormick are two popular brands.)
- ✎ Four spoons
- ✎ A paper towel
- ✎ A 1/8 measuring teaspoon (If you don't have one that small, fill a 1/4 measuring teaspoon halfway.)
- ✎ Cake mix (or you can make a cake from scratch)
- ✎ A circular cake pan
- ✎ Vanilla icing
- ✎ A knife for spreading the icing
- ✎ Two small bowls
- ✎ A pot for boiling (preferably with a spout for pouring)
- ✎ Two spoons for stirring
- ✎ A tablespoon
- ✎ Two colors of food coloring
- ✎ Candies or fruits that look like the things pointed out in the drawing on page 100. (For example, I used M&Ms for the lysosomes, Mike and Ikes for each mitochondrion, gummi worms for the Golgi bodies, and Airheads Xtremes for the endoplasmic reticulum. Don't worry about the nucleus. That will be made with a lump of icing.)
- ✎ An unopened bottle of a clear soda pop (like Sprite, Sierra Mist, or 7-Up) with a screw-on cap
- ✎ Two small glasses that are the same (the smaller the diameter, the better)
- ✎ A stove
- ✎ A 1/4-cup measuring cup
- ✎ A pot holder
- ✎ Water
- ✎ Rubbing alcohol (The most common concentration sold in stores is 70%. That will work, but if you can find a higher percentage, it will give even better results.)
- ✎ A 1/2-cup measuring cup
- ✎ A bathtub
- ✎ A sink with a water faucet
- ✎ A paper or Styrofoam cup
- ✎ A pin
- ✎ Water from the faucet in the bath tub
- ✎ A wire hanger (It needs to be one that your parents will let you break. If you can't find a hanger, you can use a metal wire, as long as it is rigid but bendable, just like a wire hanger.)
- ✎ Two tall glasses that are transparent and can hold at least two cups of liquid
- ✎ Sugar
- ✎ A measuring tablespoon
- ✎ A 1-cup measuring cup
- ✎ Food coloring that is liquid (not a gel)
- ✎ A 2-liter bottle with a lid, like the kind soda comes in
- ✎ A balloon that is at least 8 inches in diameter when inflated
- ✎ A straw
- ✎ Some modeling clay, like Play-Doh
- ✎ A nail
- ✎ A screwdriver

- ✎ Three ½-liter bottles, like the ones water comes in (It is best to use bottles made out of thin plastic. The bottles soda comes in are usually made of sturdy plastic. Thin water bottles work best. The bottles also need to have their lids.)
- ✎ Kitchen tongs
- ✎ A refrigerator
- ✎ A freezer
- ✎ Gumdrops of four different colors (You will need two each of three colors and eight of the fourth color.)
- ✎ Eight toothpicks
- ✎ Three small glasses, like juice glasses
- ✎ A Styrofoam cup or mug that is used for hot beverages
- ✎ Yeast
- ✎ A measuring teaspoon
- ✎ Large wooden matches (at least three, but ideally, lots more)
- ✎ A plate made from a substance that can't catch fire or melt (like ceramic or metal)
- ✎ A small lump of modeling clay (like Play-Doh)
- ✎ Five pennies (or coins of similar thickness)
- ✎ Three different sheets of construction paper, each of a different color (One should be red.)
- ✎ Three leaves that have interesting shapes
- ✎ Cellophane tape
- ✎ Several small rocks or paperweights
- ✎ A flashlight (It shouldn't be very bright. You will be shining it in front of your eye, as shown in the picture on page 126. A very bright flashlight could harm your eyes when used in this way. Use only a standard (non-LED) flashlight, and have an adult check to see if it is too bright to be used safely. If it is too bright, try putting old batteries in it to reduce the brightness.)
- ✎ A dark room with a blank wall
- ✎

Supplies for Science in the Middle of the 19th Century (Lessons 46-60)

- ✎ Three Ziploc bags
- ✎ A large Ziploc bag, like the kind you use for putting food in the freezer
- ✎ Two small bowls
- ✎ Two straws, at least one of which must be able to bend
- ✎ Water
- ✎ A stove
- ✎ Kitchen tongs
- ✎ Bouillon cubes (beef or chicken) or meat broth that is not cloudy
- ✎ Cellophane tape
- ✎ An oven mitt
- ✎ Red (sometimes called purple) cabbage
- ✎ White vinegar
- ✎ A measuring teaspoon
- ✎ A measuring tablespoon
- ✎ A ½-cup measuring cup
- ✎ Three tablespoon-sized spoons (They don't need to be measuring tablespoons.)
- ✎ Three small glasses, like juice glasses

- ✎ Three small cups or bowls that are mostly white on the inside
- ✎ A mug or cup used for hot drinks
- ✎ A pot for boiling
- ✎ Foil or plastic wrap
- ✎ Ammonia
- ✎ Lots of ice cubes
- ✎ ½ cup of salt
- ✎ 2 tablespoons of sugar
- ✎ ¼ teaspoon of vanilla
- ✎ 1 cup of milk (Whole milk is best.)
- ✎ A sink with a faucet
- ✎ A pad of paper that has several sheets attached to one another at the top but unattached at the bottom, like a pad of Post-it notes (See the picture on page 155.)
- ✎ A pencil
- ✎ Red food coloring
- ✎ Green food coloring
- ✎ Two tall glasses
- ✎ A spoon
- ✎ Two flashlights (The closer they are to each other in brightness, the better.)
- ✎ Black construction paper
- ✎ Scissors
- ✎ A dark room
- ✎ A blank, white sheet of paper
- ✎ A Ping-Pong ball
- ✎ Two drinking glasses (Plastic is best, but glass will work.)
- ✎ A flat, level counter or tabletop that can get wet (**NOTE:** If the counter isn't level, the experiment will not work well.)
- ✎ A towel
- ✎ A piece of string or yarn that is at least 3 meters (10 feet) long
- ✎ A ball-point pen
- ✎ Two plastic cups that can be ruined
- ✎ Two metal paper clips
- ✎ Soft treats like gumdrops, marshmallows, gummy bears, etc. (You need at least a dozen.)
- ✎ A plastic spoon that can be ruined
- ✎ A plastic fork
- ✎ A large, clean serving tray or cookie sheet
- ✎ Play-Doh or other modeling clay
- ✎ A camera or a pencil and paper for drawing
- ✎ Four small glasses, like juice glasses
- ✎ Seltzer water (plain, carbonated water – you need only two cups)
- ✎ Sprite, 7-Up, or any other clear soda your child will enjoy (You need only one cup. You need the same thing for the experiment in the next lesson, so keep what you don't use. Don't put it in a refrigerator, however, because it needs to be at room temperature.)
- ✎ Coke, Pepsi, or any other dark soda your child will enjoy (You need only one cup.)
- ✎ Yeast
- ✎ Sugar
- ✎ Rubbing alcohol

- ✎ A ¼-cup measuring cup
- ✎ A ¼ measuring teaspoon
- ✎ Tonic water (This can't be seltzer or plain carbonated water. It needs to have quinine in the ingredients list. Any place that sells liquor, including supermarkets, will carry it. It will be with the "mixers" that are added to alcoholic drinks and should cost less than a dollar for a small bottle, which is all you need. There is no alcohol in tonic water.)
- ✎ Sunblock lotion (The higher the SPF, the better.)
- ✎ A thin 8.5x11-inch sheet of cardboard, like the kind found on the back of a pad of paper
- ✎ Plastic wrap
- ✎ Three small glasses, like juice glasses, that are identical
- ✎ Red, green, and blue food coloring
- ✎ A 1-cup measuring cup
- ✎ Paper towels (You only need these if you get the outside of a glass wet)
- ✎ One larger glass
- ✎ Clear ammonia
- ✎ A faucet for rinsing
- ✎ Turmeric (This is a spice. Don't use turmeric supplements, because they are expensive and have other things in them. If you don't already have it, get a small bottle from the spice section of any supermarket.)

Supplies for Science in the Latter Part of the 19th Century (Lessons 46-60)

- ✎ A large, empty bottle with a narrow opening, such as a plastic 2-liter bottle like the ones soda comes in
- ✎ A sink with a water faucet
- ✎ A stopwatch (or other timer that keeps track of seconds)
- ✎ Water
- ✎ Blue food coloring
- ✎ Yellow food coloring
- ✎ Three small glasses, like juice glasses (They should all be the same size.)
- ✎ Paper towels
- ✎ Scissors
- ✎ Two ½-liter plastic bottles, like the ones water comes in (They must have their lids.)
- ✎ A match
- ✎ A ruler
- ✎ Cooking oil
- ✎ Rubbing alcohol
- ✎ Three very similar long, thin objects (Food skewers would be ideal, but three very similar pencils will work. The thinner the better. Toothpicks aren't long enough.)
- ✎ A funnel (optional – used to recover the cooking oil and rubbing alcohol)
- ✎ Dish soap
- ✎ Grape juice (It must be juice. It cannot be an artificially-flavored grape drink. A different dark fruit juice will work, but not as well.)
- ✎ Baking soda
- ✎ Two Q-tips or small paintbrushes
- ✎ A piece of white paper, preferably one without lines

- ✎ A teaspoon
- ✎ A tea bag or some coffee grounds
- ✎ Ammonia
- ✎ A ½-cup measuring cup
- ✎ A ¼ measuring teaspoon
- ✎ Two spoons for stirring
- ✎ A jar that has a wide mouth and a lid
- ✎ Thread
- ✎ Duct tape
- ✎ An LED flashlight (If you don't have an LED flashlight, use an uncovered lamp with an incandescent bulb.)
- ✎ A lighter
- ✎ Yeast
- ✎ Sugar
- ✎ A measuring tablespoon
- ✎ A ½ measuring teaspoon
- ✎ Two Ziploc bags
- ✎ Two jar lids or small dishes that are deep and large enough to hold three tablespoons of material but small enough to fit into the Ziploc bags after they have been zipped (You can also use the bottoms of two paper cups you have cut down.)
- ✎ Photocopies of pages A4–A10 in the *Helps & Hints* book that comes with this course
- ✎ **A bowl, the size you would use to eat cereal or soup**
- ✎ **Clear nail polish**
- ✎ **Black construction paper**
- ✎ **A hair dryer**
- ✎ **Popcorn (This can be a bag of microwave popcorn or popcorn that is made on the stove.)**
- ✎ **A microwave or stove to cook the popcorn**
- ✎ **Speakers for a computer (Any speakers that have a plug similar to the one pictured on page 221 will work. If you don't have speakers, you can use earphones, but **don't put the earphones on or in your ears.** Have a helper hold them a few inches away from your ears.)**
- ✎ **Aluminum foil**
- ✎ **Cellophane tape**
- ✎ **A pencil or plastic pen that has a cap**
- ✎ **At least two different kinds of batteries (If possible, one of them should be a 9-Volt battery.)**

Supplies for Science in the Late 19th Century (Lessons 76-90)

- ✎ Steel wool
- ✎ Aluminum foil (Heavy duty is best, but you can make regular aluminum foil work.)
- ✎ A 9-volt battery
- ✎ Cellophane tape
- ✎ Scissors
- ✎ Water
- ✎ A jar that can experience large temperature changes, like a canning jar
- ✎ A surface to which you can tape things (not made of wood or anything else flammable)
- ✎ Distilled water (It is sold in most grocery stores, but make sure it is *distilled* water, not drinking water. You will use it later on, so get at least two liters, which is about half a gallon.)

- ✎ Two saucepans or pots (They can be very small, but they need to be very clean. The bottoms of the pots shouldn't have any stains or burn marks on them.)
- ✎ A measuring tablespoon
- ✎ A stove
- ✎ A ½-cup measuring cup
- ✎ A 2-liter plastic bottle, like the kind soda comes in
- ✎ A ½-liter plastic bottle, like the kind water comes in
- ✎ A freezer
- ✎ Two bowls of the same size
- ✎ A dinner plate
- ✎ Two food skewers that are made of plastic or wood
- ✎ The strong magnets you used in the first section (as many as you have)
- ✎ Thread
- ✎ Paper towels
- ✎ Several books
- ✎ Epsom salt (Sold in any drug store and in the pharmacy section of most large supermarkets. Its chemical name is magnesium sulfate.)
- ✎ Ice (crushed is best, but cubes will work)
- ✎ A ladle
- ✎ A measuring cup
- ✎ A measuring teaspoon
- ✎ A wooden spoon
- ✎ A clear plastic cup
- ✎ Two metal thumbtacks
- ✎ Sugar
- ✎ A container of matches (Wooden matches work best, but paper matches will do in a pinch.)
- ✎ A candle in a holder or able to stand on its own.
- ✎ Two glasses that are a bit taller than the candle.
- ✎ A radio (It is best if it has an AM band.)
- ✎ Two shiny nails (don't use rusty ones)
- ✎ A dimly-lit room
- ✎ A microwave oven
- ✎ Four small glasses, like juice glasses
- ✎ A wooden food skewer or a small twig from a bush or tree
- ✎ A slice of bread
- ✎ Flour
- ✎ A metal pie pan
- ✎ A wooden pencil or plastic pen
- ✎ Clear soda (like Sprite, 7-Up, or seltzer water) in unopened, clear plastic bottles (You need two bottles, the smaller the better. Diet sodas are just as good as regular sodas.)
- ✎ A sink
- ✎ Wax paper
- ✎ A metal butter knife
- ✎ Milk
- ✎ Fruit juice or some other sweet drink
- ✎ Vegetable oil
- ✎ A tablespoon

- 👤 Blue food coloring (It needs to be a liquid, not a gel.)
- 👤 Three small glasses, like juice glasses
- 👤 Three eggs (raw)
- 👤 Three bowls deep enough to submerge the eggs
- 👤 Vinegar
- 👤 Salt
- 👤 Corn syrup
- 👤 A spoon large enough to hold an egg
- 👤 A ½-teaspoon measuring spoon
- 👤 A colander or other device that will allow water to pass through it but not allow large things to pass through it.
- 👤 A string of incandescent Christmas lights
- 👤 A string of LED Christmas lights (not necessary, as there is an internet video you can watch)
- 👤 Gloves