

## Experiments and Activities

There are a lot of experiments and activities in this course, but most of them are purposely kept fairly simple. Ideally, the students should be doing most of the work in the experiments and activities, but *they must be supervised by an adult*. While most of the experiments and activities are very safe, some require the use of flames, and others use sharp instruments. Thus, *you should have the children do all of the experiments under constant adult supervision*.

Most of the experiments in the course don't take much time, but some are long-term experiments. However, you don't have to worry about looking ahead to see whether an experiment is 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 and open flames should be avoided, 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 (You can get it at any drugstore or large supermarket.)
-  Active dry yeast (available in the baking section of any supermarket)
-  Rubbing alcohol
-  **A pineapple (It *cannot* be canned. It needs to be an actual pineapple.)**

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

-  A hand-held, flat mirror
-  Super glue

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

-  A medicine dropper

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

-  Two magnets (You *cannot* use refrigerator magnets for this experiment, because they are made of composite materials that behave differently from normal bar magnets.)
-  Alcohol (The container needs to indicate that it is at least 90% pure. Rubbing alcohol is usually 91% pure, and denatured alcohol, which is sold in hardware stores, is usually 95% pure. Either will work.)

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

- ✎ Sandpaper

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

- ✎ Craft sticks or popsicle sticks (You need two if you are doing only the regular lessons, and 18 if you are doing the challenge lessons.)

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

Supplies for Science Before Christ, Part 1 (Lessons 1-15)

- ✎ A ruler
- ✎ A measuring tape or another ruler
- ✎ A tree or tall pole that casts an easy-to-see shadow
- ✎ Four small glasses, like juice glasses
- ✎ A candle that either supports itself or is in a candle holder
- ✎ Matches or a lighter
- ✎ A medium-sized bowl
- ✎ Two rubber bands, one that is thick, and one that is thin. They need to be long enough to fit around the top and bottom of the bowl but small enough to be stretched tight when they are put there.
- ✎ A long rubber band (The longer it is, the easier it will be to see the effect.)
- ✎ An empty metal can, like the kind soup comes in
- ✎ A can opener
- ✎ Plastic wrap
- ✎ Tape
- ✎ Pepper
- ✎ Salt
- ✎ A magnifying glass
- ✎ Hydrogen peroxide (You can get it at any drugstore or large supermarket.)
- ✎ Active dry yeast (available in the baking section of any supermarket)
- ✎ Dish soap or liquid hand soap
- ✎ A 1-cup measuring cup
- ✎ A ½-cup measuring cup
- ✎ A ¼-cup measuring cup
- ✎ A measuring tablespoon
- ✎ A measuring teaspoon
- ✎ A tall glass (It is best if you can see through it, but that is not necessary.)
- ✎ A tap that can produce warm water.
- ✎ An empty sink
- ✎ Water
- ✎ Something to heat the water (A microwave will do, as will a stove and a pot.)
- ✎ A hotpad
- ✎ Two blank sheets of white paper
- ✎ Two large hard candies that are different colors (I used cinamon candies and lemon drops, but you can use whatever you like. You will need six of each.)

- ✎ A small candy (I used Skittles, but you can use whatever you like. It needs to be smaller than the other hard candies. You need eight, and they need to be all the same color.)
- ✎ Syrup, honey, or icing (Essentially, it needs to be something sweet and a bit sticky.)
- ✎ A butter knife
- ✎ A paper plate
- ✎ About 30 pennies (the duller and uglier, the better)
- ✎ A nail (It should *not* be a stainless steel or a galvanized nail.)
- ✎ White vinegar
- ✎ Rubbing alcohol
- ✎ A small amount of raw ground beef
- ✎ Two paper towels
- ✎ **Jell-O, or some other form of gelatin**
- ✎ **A pineapple (It can't be canned. It needs to be an actual pineapple.)**
- ✎ **A knife to cut the pineapple**
- ✎ **Two spoons**
- ✎ **Butter (Real butter is better than margarine, but margarine will work.)**
- ✎ **Two tall glasses**
- ✎ **Elmer's glue (or any other white, all-purpose glue in a bottle)**
- ✎ **Pepper in a pepper shaker**

### Supplies for Science Before Christ, Part 2 (Lessons 16-30)

- ✎ If you can't do multiplication and division well, a calculator
- ✎ A 2-liter bottle, like the kind soda comes in
- ✎ Vinegar
- ✎ Baking soda
- ✎ A funnel
- ✎ A measuring teaspoon
- ✎ A measuring cup
- ✎ A candle
- ✎ Something you can use to light the candle
- ✎ A heavy rock (You need to be able to lift it easily.)
- ✎ A medium-weight rock (It needs to be noticeably lighter than the one above.)
- ✎ A very light rock (It needs to be a rock, but it needs to be noticeably lighter than the one above.)
- ✎ A small board or tray that you can set your rocks on and push them off the edge easily
- ✎ A ruler or sturdy stick
- ✎ A stepstool, ladder, or something that is safe to stand on so that you can reach high up
- ✎ An empty soup can with one open end
- ✎ A hammer
- ✎ A reasonably thin nail, like a finishing nail
- ✎ A long nail
- ✎ Wax paper
- ✎ Scissors
- ✎ Tape
- ✎ A dark towel or blanket
- ✎ A sunny window (If it's not sunny, you can use a dark room and a lamp that has a shape which makes it easy to recognize the top and bottom of the lamp.)
- ✎ A square or rectangle of cardboard (It needs to be larger than a paper plate)
- ✎ Six paper plates

- ✎ Crayons, colored pencils, or markers
- ✎ Some modeling clay, like Play-Doh
- ✎ A flashlight
- ✎ A hand-held, flat mirror
- ✎ A thick piece of cardboard, like the side from a cardboard box
- ✎ A white piece of paper
- ✎ A black piece of construction paper
- ✎ Thread
- ✎ Two nickels (Two of any coin will work.)
- ✎ A sink that can be filled with water
- ✎ A shovel, rake, or other tool that has a long, strong, wooden handle
- ✎ Some old hardcover books
- ✎ A heavy couch or other piece of furniture that has a small gap between its bottom and the floor.
- ✎ A dime
- ✎ A ruler
- ✎ Two balls of different size (like a baseball and a basketball)
- ✎ A baseball or tennis ball (It can be some other ball, as long as it is about the same size as a tennis ball and has a thick outer coating into which pins can be stuck without harming the ball.)
- ✎ Two straight pins
- ✎ **At least six quarters and at least two pennies**
- ✎ **Super glue**
- ✎ **A plastic pen (It should be made of slick plastic.)**
- ✎ **A wheel (It can be from anything that rolls - a bicycle, wagon, wheelchair, etc. It works best if you can remove it from the thing to which it is attached so that there isn't a significant bump in the center.)**
- ✎ **String**
- ✎ **A sheet of cardboard**
- ✎ **Some Ziploc bags**

#### Supplies for Science Soon After Christ (Lessons 31-45)

- ✎ Red grapes (You cannot use green grapes. You need the grapes that have a red peel and a whitish, fleshy interior. They are the most common grape [other than the green grapes] sold in the produce section of the supermarket.)
- ✎ Clear vinegar
- ✎ Clear ammonia (sold with the cleaners in the supermarket)
- ✎ Six small glasses, like juice glasses (The glass needs to be clear, not colored.)
- ✎ Plastic wrap
- ✎ Four bendable straws (You could use flexible plastic tubing instead, as long as it's okay to ruin the tubing in the course of the experiment.)
- ✎ A tall glass
- ✎ Tape
- ✎ A pin or needle
- ✎ Scissors
- ✎ A square of paper, about 13-cm (5-inches) by 13-cm (5-inches)
- ✎ A pencil that has never been used
- ✎ A straight pin
- ✎ A pan in which you can boil water
- ✎ Water

- 👉 Two pencils that are the same size
- 👉 A flat, hand-held mirror (It can't be a magnifying mirror.)
- 👉 A ruler or meter stick
- 👉 Some modeling clay, like Play-Doh
- 👉 A paper plate
- 👉 Crayons, colored pencils, or markers
- 👉 A small container, like a Tupperware storage container (It needs to be one you can mark up.)
- 👉 A quarter
- 👉 Two toothpicks
- 👉 A flashlight
- 👉 A marker
- 👉 Vegetable oil
- 👉 Paper towels or a dishtowel
- 👉 Glue
- 👉 A stopwatch or a watch with a second hand
- 👉 A large piece of thick cardboard (It needs to be thick enough to push a thumbtack into.)
- 👉 String
- 👉 Two pushpins or thumbtacks
- 👉 A medicine dropper
- 👉 A plastic straw (preferably one that can bend on one end)
- 👉 A spoon
- 👉 A tape measure
- 👉 A few antacid tablets (TUMS would be best, but anything that says calcium carbonate is the active ingredient will work.)
- 👉 Baking soda
- 👉 Dish soap
- 👉 A large metal spoon
- 👉 A spoon for stirring
- 👉 A paper plate or bowl
- 👉 A measuring teaspoon (If you have two measuring teaspoons, it would make things easier.)
- 👉 A ½-cup measuring cup
- 👉 Two glasses (They shouldn't be juice glasses. They should be taller than that.)
- 👉 Paper towels

## Supplies for Science in the Early Middle Ages (Lessons 46-60)

- 👉 Several marbles
- 👉 A rubber band (It should be short enough to comfortably stretch between your index finger and thumb, but long enough to allow you to use it to launch a pebble into the air. It also needs to be wide enough so a pebble can fit into it.)
- 👉 A pebble that fits comfortably in the rubber band.
- 👉 An open space outside
- 👉 A bathtub
- 👉 A magnifying mirror (It is easiest if the mirror is a small, hand-held magnifying mirror. However, it can be a larger one, such as one that sits on a vanity. The larger the mirror, the more dramatic the effect.)
- 👉 Some newspaper
- 👉 Kitchen tongs or pliers
- 👉 A small candle that stands up on its own (This can be a birthday-cake candle stuck in some clay, or it can be a candle that is wide enough to stand up on its own but still not very tall.)
- 👉 A glass that is taller than the candle
- 👉 A glass jar or other glass container that is significantly larger than the glass listed above
- 👉 A glass bowl or other glass container that is larger than the glass or jar listed above
- 👉 Matches or a lighter
- 👉 Unflavored gelatin (This kind of gelatin is clear when it sets.)
- 👉 A small desert bowl or a small glass
- 👉 A round cookie cutter or a glass
- 👉 A butter knife
- 👉 A spoon
- 👉 A spatula
- 👉 A pie pan, preferably with a completely flat bottom
- 👉 Two white paper plates
- 👉 A piece of white paper that has print on it, such as a newspaper
- 👉 A flashlight
- 👉 Black construction paper
- 👉 Tape
- 👉 Scissors
- 👉 Two magnets (You cannot use refrigerator magnets for this experiment, because they are made of composite materials that behave differently from normal bar magnets.)
- 👉 Two metal sewing needles
- 👉 Two plastic one-liter bottles (Actually, anything that is transparent, tall, thin, and able to hold water will do. Glasses don't work very well because they tend to be wider at the top than the bottom, and that makes it harder to see the effect.)
- 👉 Water
- 👉 Alcohol (The container needs to indicate that it is at least 90% pure. Rubbing alcohol is usually 91% pure, and denatured alcohol, which is sold in hardware stores, is usually 95% pure. Either will work.)
- 👉 A ½-cup measuring cup (You need the kind that is used to measure out solids, because you will fill it to overflowing rather than filling it to a certain line.)
- 👉 A funnel
- 👉 A spray bottle that can produce a fine mist
- 👉 A small ball, like a baseball, tennis ball, or golf ball
- 👉 Masking tape (or another type of tape that is easy to see)

- ✎ A board that is at least 60 centimeters (2 feet) in length
- ✎ Some books
- ✎ A normal sheet of paper (writing paper, printer paper, etc.)
- ✎ Some toilet paper
- ✎ A small rock (It needs to be about the same size as a wadded-up sheet of paper.)
- ✎ An empty 12-ounce can (like the ones containing soda)
- ✎ A measuring cup
- ✎ A flat surface that can stand to get a bit wet
- ✎ Life savers mints or candies (The mints work best.)
- ✎ A small plate
- ✎ A pot for boiling water
- ✎ A large bowl
- ✎ A Styrofoam cup
- ✎ A thimble (or something else you can use to push on a needle without getting hurt)
- ✎ A birthday candle and something to hold it upright (You can just use a lump of clay.)
- ✎ A hand-held mirror that does not magnify.

#### Supplies for Science in the Late Middle Ages (Lessons 61-75)

- ✎ A hand-sized ball (like a baseball or tennis ball)
- ✎ A wagon or something else that you can ride on as it is pulled by another person
- ✎ A short sidewalk or driveway along which the wagon can be pulled for a little while
- ✎ A bag of M&M or Skittles candies
- ✎ Colored pencils or crayons (Optional – If you use them, you will need pencils of roughly the same colors as the candies listed above.)
- ✎ A bowl
- ✎ A graphing grid (You can get your own graph paper or use the grid that is on page A3 of your parent/teacher's *Helps and Hints* book.)
- ✎ A plastic 2-liter bottle, like the kind that soda comes in. (A plastic milk carton will also work.)
- ✎ A nail (One that is thick enough to make a hole that water can easily flow through.)
- ✎ A small container (like a juice glass or a small jar) made of clear glass
- ✎ A Ziploc bag large enough to put the glass inside and still zip shut
- ✎ A one-liter plastic bottle
- ✎ Dried beans from the supermarket
- ✎ Scissors
- ✎ A paper towel
- ✎ Water
- ✎ Legos (marbles or beads that are made of glass or plastic will work as well)
- ✎ A stopwatch or a watch with a seconds hand
- ✎ Tape
- ✎ A sheet of dark (preferably black) construction paper
- ✎ A nickel
- ✎ Several white sheets of paper
- ✎ A mirror
- ✎ Several leaves from different plants (When you pull them off the plant, make sure the stalk that connects them to the branch comes off with each leaf.)
- ✎ Finger paint (Regular paint and brushes will work as well.)
- ✎ Newspapers
- ✎ Some heavy books

- ✎ A place with several different kinds of trees and bushes to investigate
- ✎ A tree stump sitting outside. (It would actually be a bit better to find a large tree branch that has fallen on the ground and have an adult use a saw to cut it in the middle. The idea is that you need a nice, flat surface that you can sand to bring out the tree rings. It is also best to use a stump or branch from a tree that loses its leaves in the winter.)
- ✎ Sandpaper
- ✎ Some modeling clay, like Play-Doh
- ✎ Wooden matches
- ✎ A birthday candle
- ✎ Three quarters
- ✎ A tall glass
- ✎ A glass pan (or at least a pan with low edges)
- ✎ Food coloring
- ✎ A spoon for stirring
- ✎ Unflavored gelatin (This kind of gelatin is clear when it sets.)
- ✎ A round cookie cutter or a small glass
- ✎ A butter knife
- ✎ A spoon
- ✎ A spatula
- ✎ A pie pan, preferably with a completely flat bottom
- ✎ A white paper plate
- ✎ A flashlight
- ✎ Black construction paper
- ✎ Skim milk (Even 1% fat doesn't work nearly as well.)
- ✎ Vinegar
- ✎ A tablespoon
- ✎ A 1-cup measuring cup and a 1/2-cup measuring cup
- ✎ A saucepan
- ✎ A stove
- ✎ A funnel
- ✎ A coffee filter
- ✎ A lamp that can be pointed or tilted so its light bulb (not a compact fluorescent or LED light) can be put close to the surface of a counter. (If it's a warm, sunny day, don't worry about the lamp.)
- ✎ A plate (It can't be made of paper, foam, or plastic.)
- ✎ A cookie cutter (The more interesting the shape, the better.)

## Supplies for Science in the Early Renaissance (Lessons 76-90)

- 👉 Two glasses of the same size
- 👉 A straw
- 👉 Modeling clay, like Play-Doh
- 👉 Water
- 👉 Salt
- 👉 A spoon for stirring
- 👉 A garden hose attached to a spigot
- 👉 Clothes you can get wet in
- 👉 A rock that is small enough for you to completely close your hand around it
- 👉 A pie pan or other cooking pan that has a raised edge all the way around it
- 👉 Some dirt
- 👉 Scissors
- 👉 Glue (A glue stick works best, but any glue will do.)
- 👉 Craft sticks (or Popsicle sticks): Two if you are doing only the regular lessons, 18 if you are doing the challenge lessons.
- 👉 An index card or other piece of cardboard that is sturdy but is thin enough to fold easily
- 👉 Tape
- 👉 Four spools of thread. (If the spools are empty, that's ideal, but spools with thread on them will work as well.)
- 👉 Two long rubber bands or several smaller rubber bands.
- 👉 String (It needs to be strong string. Yarn will do if you don't have any strong string.)
- 👉 A sharp knife
- 👉 A sheet of construction paper
- 👉 A working, hand-held flashlight
- 👉 Aluminum foil
- 👉 A cardboard tube from the center of a roll of paper towels
- 👉 A reasonably large funnel
- 👉 Wax paper or plastic wrap
- 👉 A stopwatch or a watch with a second hand
- 👉 A block of hard cheese that is easy to bite into (A block of cheddar cheese is ideal.)
- 👉 Two flat pieces of wood, wooden boards, or rectangular wooden blocks (They don't have to be very big.)
- 👉 A few marbles that are all the same size
- 👉 A smooth countertop that has an edge off of which you can hang something
- 👉 An empty CD case (A small box will work as well.)
- 👉 At least 40 pennies (Any coin will work, as long as you use all the same kind of coin.)
- 👉 A Ziploc bag
- 👉 **Two bananas that are over ripe (They should have several dark spots on their peels.)**
- 👉 **A small Styrofoam cup**