



2019  
Girl Scout  
Genius

## Raid the Fridge

As a Girl Scout, the world of Girl Scouting is a fabulous place for you to learn about yourself and the world around you. We are so glad you are going on this Girl Scout adventure this summer.

Do you like helping people, being creative, trying to understand how things work, solving puzzles and problems and doing hands-on science projects? Then you'll love your Girl Scout Genius packets! Girl Scouts is committed to providing STEM (science, technology, engineering and math) programming for girls. Activities in this packet, and the next two packets, will give you a taste of all things science and engineering. *Raid the Fridge* focuses on different science experiments that use common ingredients you can find in your kitchen.

Girl Scouts is also about spending time with adults who can help you learn and grow, so find an adult partner or older friend to help you read instructions and do activities.

**Let's get started!**

### More Summer Fun!

Thank you for subscribing to the Girl Scout Genius series. The series includes three packets, mailed directly to girls, and a participation patch.

Girl Scouts is all about the girl. Girls are front and center whether they are raiding the fridge for the ingredients to a cool science experiment, or climbing a rock wall for the first time. Summer camp opportunities can be found at [gswise.org](http://gswise.org). Send your Girl Scout for a couple of days, a week or even the entire summer in the sun. Take part in the adult and girl overnights available at Camp Silver Brook and Camp Alice Chester. Call **800-565-4475** or [customercare@gswise.org](mailto:customercare@gswise.org) with your questions.

# Invisible Ink

Making invisible ink is lots of fun! You can pretend you are a secret agent as you keep all your secret codes and messages hidden from others. All you need is some basic household items and the hidden power of lemon juice.

## What you'll need:

- Half of a lemon or 2 tablespoons of lemon juice
- Water
- Spoon
- Bowl
- Q-tip
- Light bulb (lit and warm)

## Instructions:

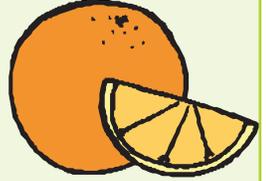
1. Squeeze some lemon juice into the bowl and add a few drops of water.
2. Mix the water and lemon juice with the spoon.
3. Dip the Q-tip into the mixture and write a message or draw a simple picture in the space below (or on a separate sheet of white paper).
4. Wait for the juice to dry so it becomes completely invisible.
5. When you are ready to read your secret message or see your picture, heat the paper by holding it close to the light bulb.

**Write your message or draw your picture here.**

## Now try this!

Other substances work the same way. Try this experiment with orange juice, honey, milk, onion juice or vinegar. What substance works best? Circle your answer below.

Orange  
juice



Honey

Milk



Onion  
juice

Vinegar



## What's happening?

Did you notice that your words or picture looked brown? That's because lemon juice is an organic, or living, substance that turns brown when heated. The science term for this is **oxidation**.

# Does an Orange Float or Sink?

If you gently place an orange in a bowl of water do you think it will float or sink? Give this fun science experiment about density a try and answer the question.

Circle your prediction below.

**Float**      **Sink**

## What you'll need:

- An orange
- A deep bowl or container
- Water

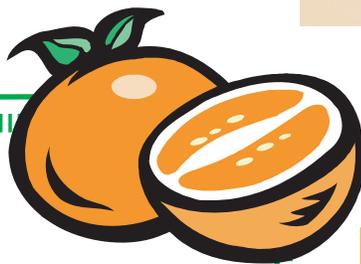
## Instructions:

1. Fill the bowl with water.
2. Put the orange in the water and watch what happens.



## What's happening?

The first time you put the orange in the bowl of water it probably floated on the surface but after you removed the rind, it probably sunk to the bottom, why? The rind of an orange is full of tiny holes. Look closely, can you see them? These holes, or air pockets, make the orange float. The inside of an orange does not have air pockets to help it float, so it sinks. The science term that describes whether an object floats or sinks is *buoyancy*.



## Now try this!

1. Peel the rind from the orange.
2. Put the orange in the water and watch what happens.

*\*It is strongly recommended that you do both activities outside.*

## Soda Explosion

Everyone likes to watch the bubbles in soda go ‘pop.’ These experiments with soda bubbles are a lot of fun and are sure to amaze your friends and family.

### What you’ll need:

- Can of soda

### Instructions:

1. Shake the can of soda for about 10 seconds.
2. Point the opening away from you.
3. Open the can.

### What’s happening?

Soda contains bubbles. Those bubbles are made up of a gas called carbon dioxide. The bubbles stay trapped inside the soda can until you pour it into a glass and drink it. The popping sound you hear when you drink or pour soda is carbon dioxide slowly being released into the air. When you shake the can it makes some of the bubbles pop which releases the carbon dioxide gas inside the can. This adds pressure to the can. When you open the can, you release the pressure making the bubbles and soda explode out all at once.

## Erupting Geyser

*Try this experiment if you want to see an even bigger eruption and don’t mind a bigger mess.*

### What you’ll need:

- 2 Liter bottle of Diet Coke
- About half a pack of Mentos candy
- Construction paper
- Toothpick
- Tape

### Instructions:

1. Make sure you are doing this activity outside.
2. We will start by making a handmade funnel. Roll construction paper around an unopened roll of Mentos candies. Use tape at both ends to hold the shape and size of the rolled paper and then remove the roll of Mentos candy.
3. Stand the Diet Coke upright and take off the cap.
4. Place one end of the paper tube into the mouth of a freshly-opened, 2-liter bottle of Diet Coke. Secure the tube in place with a bit of tape.
5. Just above the mouth of the bottle, insert a toothpick into the tube. Make sure the toothpick is centered and is stuck through the entire tube.
6. Now place about half of the pack of the Mentos candy in the handmade funnel, the toothpick should stop them from going completely into the soda for now.
7. When you’re ready, yank the toothpick out of the tube and run like mad! If you’ve done it properly a huge geyser of Diet Coke should come flying out of the bottle; it’s a very impressive sight.

### What’s happening?

The Mentos candy speeds up the release of the carbon dioxide gas in the Diet Coke. This makes the gas and liquid explode out of the bottle. Scientists call this breaking the *surface tension* of the liquid.

The secret is in the Mentos candy. It has a bumpy surface. Carbon dioxide bubbles like to attach themselves to things that have a bumpy surface so the second the Mentos candy is added to the Diet Coke the bubbles rush toward it all at once. But the Mentos isn’t big enough to hold all of the bubbles so the remaining bubbles are forced up and out of the small opening of the bottle taking the liquid with them.

# Magic Ketchup

You can make a pack of ketchup float and sink at your command while it's sealed inside a bottle!

## What you'll need:

- A 1 liter plastic bottle
- Water
- Ketchup pack from a fast food restaurant
- Salt (Kosher salt will keep the water from getting too cloudy, although it will usually clear up over time if using regular table salt.)

## Instructions:

### Make the ketchup pack float

1. Remove any labels from the bottle and fill it almost to the top with water.
2. Add a ketchup pack to the bottle.
3. If the ketchup floats - go to the next section. 
4. If the ketchup pack sinks, add about 3 tablespoons (45 ml) of salt to the bottle. Cap it and shake it up until the salt dissolves.
5. Continue adding salt, a few tablespoons at a time until the ketchup floats.

### Make the ketchup pack float AND sink

1. Once the ketchup pack is consistently floating, make sure the bottle is filled to the top with water, and then cap it tightly.
2. Now squeeze the bottle. The magic ketchup should sink when you squeeze the bottle and float up when you release it. With some practice you can get it to stop in the middle of the bottle.
3. If the ketchup pack does not sink when you squeeze it, try a different kind of ketchup pack or try a mustard or soy sauce pack instead.

## What's happening?

You might not know this but there is a little air bubble inside of the ketchup packet. That bubble helps the ketchup pack float. When you squeeze the bottle hard enough it makes that bubble smaller so the packet sinks. When you release the pressure, the bubble expands so the ketchup pack floats back up.

This experiment is all about what it takes to make an object float or sink. If you had to add salt, you were adjusting the water's density to get the ketchup to float. The science terms for this are *buoyancy* and *density*.

## Now try this!

- Fill the bottle with cold or warm water. Does that affect how the ketchup pack floats?
- Use a different size bottle. Does that affect how much you have to squeeze to get the packet to sink?

**Write or draw a picture of what happened below.**



# Frozen Fun

Many interesting things happen when you freeze and then melt ice. Try these experiments to expand on that idea.

## 1 Ice Melt Experiment

### What you'll need:

- A clear plastic glass or drinking bottle
- 1/4 cup of water
- Crayon or permanent marker

### Instructions

1. Fill the clear plastic glass or bottle with the water.
2. Mark the level of the water with the crayon or marker.
3. Put the container in the freezer until the water is frozen.
4. Take the glass or bottle out of the freezer and mark the level of the frozen water.
5. Let the ice melt again and mark the level of the water again.

### What's happening?

When the water froze it grew bigger and took up more room in the cup. Scientists call this *expansion*.

### Now try this!

Knowing that water grows bigger, or expands, when it is frozen what do you think will happen if you fill a glass with warm water to the very top and then put an ice cube in the glass? Will the ice melt and spill over the sides? Experiment and find out!

## 2 Ice Melt Experiment

### What you'll need:

- A clear glass
- Warm water
- Ice cube

### Instructions:

1. Fill the glass to the top with warm water.
2. Gently lower in the ice cube, making sure you don't bump the table or spill any water over the edge of the glass.
3. Watch the water level carefully as the ice cube melts, what happens?

### What's happening?

Even though the ice cube is big when it goes into the water, when it melts that water takes up less space than the frozen ice cube. Therefore the level of the water stays about the same.



### Ice Race

Gather your friends or family and give everyone an ice cube. On your "go," see who can melt their ice cube the fastest. There are no rules so be as creative as you can to get your ice cube to melt first!

# Poke a Potato

Is it possible to stab a potato with a drinking straw? Find out with this fun science experiment that shows how *air pressure* can be used in surprising ways.

## What you'll need:

- Stiff plastic drinking straws
- A raw potato

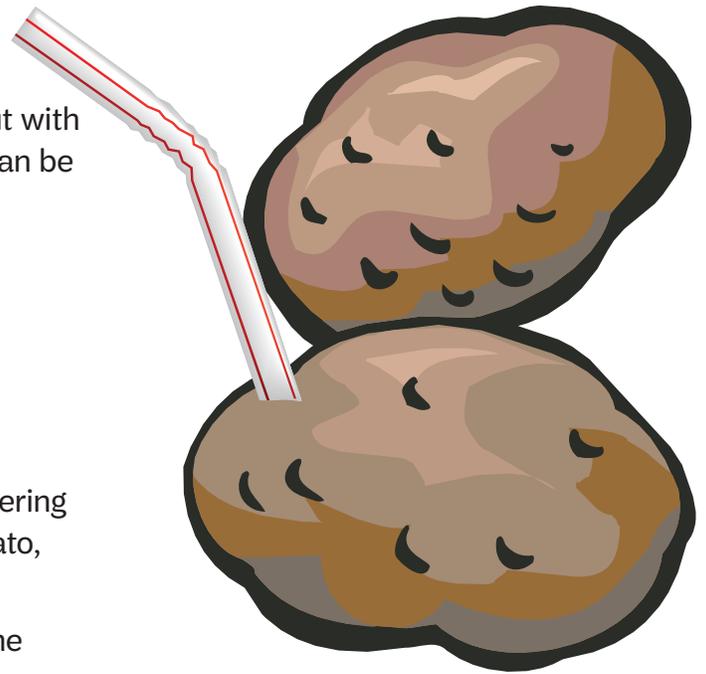
## Instructions:

1. Hold a plastic drinking straw by its sides (without covering the hole at the top) and try quickly stabbing the potato, what happens?
2. Repeat the experiment with a new straw but this time place your thumb over the top, covering the hole.

## What's happening?



Your second try was more successful than the first. Why? Covering the top of the straw with your thumb traps the air inside the straw. As you stab the straw through the potato skin it makes that air pack closely together. This makes the straw strong enough to pierce the potato. The science term for this is *compression*. The first time you tried to pierce the potato you just pushed the air that was inside the straw out of it so the straw wasn't strong enough to pierce the potato.



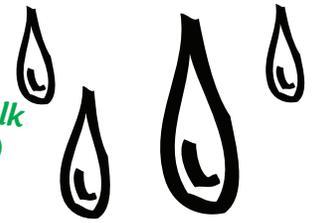
## Now try this!

Try this experiment with different types of potatoes. What happens?

**Write or draw a picture of what happened below.**

# Music Symphony with H<sub>2</sub>O

(That's science talk for water!)



Have you ever tried making music with glasses or bottles filled with water? Experiment with your own special sounds by turning glasses of water into instruments. Make some cool music and find out how it works.

## What you'll need:

- Five or more drinking glasses or glass bottles
- Water
- Wooden stick (such as a pencil)

## Instructions:

1. Line the glasses up next to each other and fill them with different amounts of water. The first should have just a little water while the last should be almost full, the ones in between should have slightly more than the last.
2. Use the pencil to gently hit the side of the glass with the least amount of water and observe the sound, then hit the glass with the most water. Which glass makes the higher sound?
3. Hit the other glasses and see what noise they make. See if you can get a tune going by hitting the glasses in a certain order.

## What's happening?

Small vibrations are made when you hit the glass; this creates sound waves which travel through the water. More water means slower vibrations and a lower sound. The scientific term for this is *tone*. Each of the glasses will have a different tone when hit with the pencil. The glass with the most water will have the lowest tone while the glass with the least water will have the highest.

# Color Symphony

You made a music symphony with water, now try making a symphony with color!

## What you'll need:

- Whole milk
- Food coloring
- Liquid dishwashing soap

## Instructions:

1. Fill a flat tray (like a cookie baking sheet) with whole milk so that it just covers the bottom.
2. Add about 6-8 drops of different colored food coloring onto the milk in different spots.
3. Add about 5 drops of liquid dishwashing soap onto the drops of food coloring and watch the show!

## What's happening?

The main job of dish soap is to go after fat and break it down so it can be washed away leaving dishes clean. Since there is fat in whole milk, when you dropped the liquid soap onto the tray, it tried to break down the fat in the milk. While it was doing that, it caused the colors to scatter and mix creating a very colorful display.

# Make Your Own Slime

## What you'll need:

- Elmer's glue (most kinds of white craft glue will work)
- Two disposable cups
- Food coloring (you pick the color)
- Water
- 1 teaspoon Borax powder (available at most large grocery stores near the laundry detergent)
- Plastic spoon (for stirring)
- Tablespoon (for measuring)
- Small plastic bag

## Instructions:

1. Fill one small cup with 1/2 cup of water and add a teaspoonful of Borax powder. Stir it up and then set it aside.
2. Fill the other small cup with about one inch of glue.
3. Add three tablespoons of water to the glue and stir.
4. Add a few drops of the food coloring to the glue and stir it up until mixed.
5. Now the fun part...Add 1 tablespoon of the Borax and water solution you made earlier and stir well. Watch the slime form!
6. After the slime forms let it sit for about 30 seconds and then pull it off the spoon and play with it!

**TIP:** Keep your slime in a tightly closed plastic bag when you are not playing with it, and keep it away from the carpet and your hair. Also, be sure to keep it away from young kids or pets who might think it is food.

## What's happening?

This substance is unique because it has qualities of both a solid and a liquid. It can take the shape of its containers like a liquid does, yet you can hold it in your hand and pick it up like a solid. Scientists call substances like slime *polymers* (a chain of molecules). Jell-O, rubber bands, plastic soda bottles, even gum are all forms of polymers.

## Now try this!

- Does the amount of Borax added change the slime?
- Does the amount of water added to the glue affect the gooeyness of the slime?

**Write or draw a picture of what happened below.**

# No Girls Left Inside!

Many adults who were Girl Scouts find that their camp adventures are their fondest memories of the Girl Scout experience. You don't have to be a great adventurer or outdoor expert to enjoy Girl Scout camp. At camp girls participate in a wide variety of activities from cooking over a campfire and creating art projects to playing group games and singing silly songs. The best part of camp is making new friends and having a ton of fun. Information on summer camp and event opportunities can be found at [gswise.org](http://gswise.org). There are still plenty of openings. Camp life is the best life!

## Want to try cooking a campfire meal using the sun?

Learn about solar energy by making a solar cooker using household items.

### What you'll need:

- Shoebox
- Aluminum foil
- Black construction paper or spray paint or fabric
- Clear plastic wrap
- Glue
- Scissors or knife
- Hot dogs
- Stick

### Instructions:

1. Cover the outside of the box with black construction paper, fabric or paint. (Making the box black will help the solar oven absorb more energy from the sun than any other color.)
2. With help from an adult, cut a rectangular flap out of the top of the box lid by making three cuts - two short ones parallel to the short ends of the box and one long one parallel to the long edge of the box. Put a small crease in it so that the flap sticks up.
3. Glue aluminum foil to the inside of the bottom of the shoe box. Make sure it is shiny side up so it reflects the most light.
4. Glue aluminum foil to the inside of the flap you made in the lid as well.
5. On the inside of the box lid, lay a sheet or two of plastic wrap down and glue it in place. This will trap the heat inside the box.
6. Put your items to cook inside the box, and put the lid on. (Hot dogs work well for this experiment.)
7. Prop the flap up so that it reflects sunlight into the hole in the box top, and set it out on a spot where the sun shines. Depending on the brightness of the day and the quantity of food you're cooking, it may take anywhere from 20 minutes to two to three hours to cook something.

## What's happening?

The black box attracts the sun's rays. Those rays reflect off of the foil and get trapped inside the box. With the help of the plastic wrap, the sun's heat gets trapped inside the box which cooks the hot dog. Scientists call this type of heat *solar heat*.

## Want dessert?

Place a clean piece of foil in the bottom of the box and add chocolate or butterscotch chips. Stick a toothpick onto a marshmallow or piece of apple. Once the chips are melted, dip the marshmallow or apple into the chips.

