CRIME CATCHERS
Spy Science Kit

Decode Secret Messages!

WARNING:
This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

INSTRUCTIONS and more!
Crime Catchers Spy Science Kit Ñ
ACTIVITY GUIDE

We’re the brother and sister Crime Catcher duo, Juan Tunó and Anita Tunó. We’re kids, and we love to solve mysteries. We’re always looking for clues that can help us solve crimes.

In this kit, you’ll find everything you need to become a Crime Catcher just like us! You’ll match fingerprints, test powders and liquids, and decode secret messages. While you’re solving mysteries with us, you’ll also learn some really cool science about how real crime labs work.

In each activity, you’ll get to act and think like a real forensic scientist (a person who uses science to solve crimes). You’ll compare evidence, you’ll ask questions and you’ll also make observations using your different senses.

Welcome to the Crime Catchers team! Let’s solve some mysteries!

Juan Tunó
Anita Tunó

What You get in your kit:

- Adult Helper guide in Adult Helper envelope* (Read note below before beginning activities)
- Baking soda
- Black markers (2—one black cap, one white cap)
- Citric Acid
- Filter strips (3)
- Coffee filter
- Cups (3)
- Decoder glasses
- Flour
- Graduated cylinder and cap
- Painting
- pH strips (6)
- Plastic bag
- Rubber band
- Shoeprint
- Stir sticks (3)
- Susannah’s baking soda
- Susannah’s flour
- Suspect cards (12)
- Test tube and cap
- Adult Helper guide in Adult Helper envelope* (Read note below before beginning activities)
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- Susannah’s baking soda
- Susannah’s flour
- Suspect cards (12)
- Test tube and cap

What You need to get or use:

- Clear tape
- Crayons, colored pencils or colored markers (optional)
- Labels (sticky notes or masking tape)
- Liquid dish soap
- Magnifying glass (optional)
- Measuring cup and measuring spoons (optional)
- Paper
- Pencil (#2) (optional)
- Piece of fruit (best results are strawberries, plums, kiwis or tomatoes)
- Plate
- Rubbing alcohol (the higher the percentage of alcohol the better—minimum 70%)
- Ruler or tape measure
- Salt
- Scissors
- Toothpick (optional)
- Water (Distilled-optional)
- Tap water
- Bottled Water

SAFETY NOTE: Remind your child about the importance of careful, safe behavior when using liquids or powders in a science activity.

ADULT SUPERVISION IS REQUIRED. Not recommended for children under 8 years of age.

CAUTIONS: Ingredients and mixtures may stain fabrics. Protect your clothing and work surfaces.

ADULT SUPERVISION IS RECOMMENDED
When water is added to a mixture of citric acid and baking soda, the mixture will quickly and intensely bubble which produces carbon dioxide gas. If the container is sealed, it can build pressure and burst. Always use open (unsealed) containers such as cups/bowls when working with mixtures of citric acid and baking soda near water.
MYSTERY 1: THE CASE OF THE MYSTERIOUS PAINTING

The other day, we were helping our parents clean out the attic. It was filled with dusty old boxes. Behind one huge stack of boxes, Juan found a large picture frame wrapped in a blanket. When we unwrapped the frame, we discovered a painting none of us had seen before. Where was it from? Who painted it? How old was it?

We decided to take the painting to experts at five different art stores to see if they could answer any of our questions. At each place, the experts offered us a glass of water while we waited and then they took the painting into the back of their shop to study it. Each time they came out front to tell us they were just as stumped as we were. They didn’t know anything about the painting!

We decided that the painting would just have to stay a mystery. We took it home and hung it up on the wall. That afternoon it was raining, so we decided to watch a cool new movie at home in 3-D, wearing 3D glasses that have one red lens and one blue lens. At some point during the movie, Anita looked up at the painting and thought she saw something she’d never seen before! She took off the glasses and held them up to look at the painting through just the red lens, “Whoa, Juan! Check it out!” Juan looked at it through his red lens too, and neither of us could believe our eyes!

*Note About the Adult Helper Guide:

In this kit, you’ll find a Top Secret Adult Helper guide that will help you and your child solve two mysteries by doing scientific tests.

Both mysteries require a little advance setup from the Adult Helper. In a separate envelope labeled “For Adult Helpers Only,” you’ll find the instructions for and answers to each mystery. Look for this icon and follow the instructions in the envelope before the child begins the activity.

The activities are designed for two children, working with an adult. You can start with either mystery. As you go along, read the steps of the activity aloud to your child or take turns reading. Have fun together as your child uses scientific tests to solve the mysteries!

CRIME CATCHER SCIENCE

So how were you able to see things in the painting with the red filter that you couldn’t see before? Color filters allow us to see certain colors but not others. The red film kept you from seeing the red, orange and yellow colors in the painting, but you could see green, blue and violet. Using the film to block certain colors, you could see patterns that were invisible without the film.
Activity 1: Hidden Pictures (and Messages)!

Find out what we saw in our painting and how to read and create secret pictures and messages using color!

Let's get started!

**Step 1:** Look at this picture of our painting. Study it closely, maybe even using a magnifying glass. Let's make some observations! What do you see? What colors are in the painting? What images?

**Step 2:** Now put on your decoder glasses and look at the painting. What do you see? Let's make some observations! Is there anything in the painting you couldn't see before? What colors do you see? What images?

**Step 3:** It looks like a clue! Get your pencil and paper and draw and write what you see in the painting. What does it show? Who painted it? When was it painted?

**Treasure Hunt**

We couldn't believe our eyes when we found out that our mystery painting was really a treasure map from 1865! It was signed by Olaf Tunó, our great-great-grandfather! For an even bigger surprise, the painting's map showed that there was buried treasure at Pirate's Park, which is just around the corner from our house! We took the map we copied from the painting and went treasure hunting.

When we got to the park, we caught our breath and looked at the map. "Hmm, it looks like the map is pointing to the spot where that huge old tree is at the edge of the woods," Juan said. "That tree must have been pretty small when our great-great-grandfather buried the treasure."

When we got close to the tree, Anita said, "Wait, I think I hear something." Juan said, "I do too, someone's here!"

We heard something fall and the sound of a person running away from us. When we got to the tree, we saw a big empty hole in the ground where the treasure should have been. "I can't believe it!"

**Fun Zone!**

Try using markers or crayons to create your own secret messages or images. Think about what you just learned about the red filter and the colors it helps you see. What colors should you use to create your secret message? What colors should you use to make the message hard to read without the glasses?
Anita said. “Someone stole our great-great-grandfather’s treasure just before we got to it!”

We looked around for clues, and found a few: some hard-to-see shoeprints in the mud and a dropped lunch sack with a water bottle and some half-eaten strawberries inside. “It looks like we surprised whoever it was,” Juan said. “Yeah, but with these clues, I bet we can figure out who did this,” Anita added. We decided our suspects had to be people who worked at one of the five art stores that we’d visited that morning. They were the only other people who’d seen the painting. We called the police and they went to question each of our suspects—the 12 people working at the art stores. Each one of them denied stealing the treasure, but the police came away with some interesting information. They shared this with us on their suspect cards.

It looked like the police weren’t going to be able to solve the mystery, but we thought we might be able to. We had a list of 12 suspects to narrow down. Help us solve the clues in the next activities and find out who stole the treasure!

Activity 2: What is in the Water?

The first clue we decided to investigate was the water bottle. Remember when we visited the art stores? What did each expert give us? That’s right, a glass of water. A-ha! Some of the experts had given us fancy bottled water and some had poured us tap water. If we could tell what kind of water was in the water bottle we found—bottled or tap—we might be able to narrow down our list of suspects. Let’s test the water!

Let’s get started!

**Step 1:** Take the sheet of suspect cards and, using scissors, separate it into individual cards.

**Step 2:** We think we’ll need a chart to keep track of our crime data. Use the chart on next page to track your findings.
Fun Zone!

use the pH paper to test other SAFE liquids around your house such as vinegar, lemon juice, tomato juice, egg whites and soap. Which are acids and which are bases?

CRIME CATCHER

SCIENCE

pH paper is coated with special chemicals that are used to test whether something is an acid or a base. The pH paper will turn red if it is dipped in something acidic and it will turn blue if it’s dipped in something basic. It will stay the same if it’s dipped in something that’s neutral. Water is usually neutral but in this kit, the

<table>
<thead>
<tr>
<th>SUSPECTS</th>
<th>CLUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER TYPE</td>
<td>SHOEPRINT SIZE</td>
</tr>
<tr>
<td>Clue Water Test Results</td>
<td>T= Tap Water  B= Bottled Water</td>
</tr>
<tr>
<td>Violet Vanderpuff</td>
<td></td>
</tr>
<tr>
<td>Felicity Fuchsia</td>
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<tr>
<td>Bugsy Brown</td>
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<td>Ruby Redstone</td>
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<td>Wilhelmina White</td>
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<td>Gene Green</td>
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<td>Scarlet Smithers</td>
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<td>Marvin Maroon</td>
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<td>Boris Black</td>
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<td>Philip Periwinkle</td>
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<td>Maxwell Magenta</td>
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<td>Samantha Silver</td>
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</tr>
</tbody>
</table>

Step 3: Look at all the suspect cards and see which ones had bottled water and which ones had tap water. On the chart, write a “B” under water type by the name of each suspect who had bottled water. Write a “T” in the box under water type by the name of each suspect who had tap water.

Step 4: Now let’s use pH paper to test the tap water and the bottled water:

Cut off a very small piece of pH paper (you only need a little bit) and dip it in the sample of tap water. What color is the paper after you dipped it into the water? Write the color below.

Tap water pH paper color:

__________________________
Step 5: Cut off another small piece of pH paper and dip it in the sample of bottled water. What color is the paper? Is it the same or different from the tap water? Write the color below.

Bottled water pH paper color: _____________________________

Step 6: Now let’s test the water in the sample of clue water. Cut off another little piece of pH paper and dip it into the clue water. What color is the paper? Write the color below.

Clue water pH paper color: _____________________________

Based on the pH paper color, which kind of water is the closest to the clue water?

Enter “B” or “T” in the “Test Results” column of your spreadsheet. Now that you know what kind of water the thief was drinking, match this with suspects who were drinking the same kind of water. One of them probably stole the treasure! You can cross out all of the suspects who were drinking a different kind of water.

The water helped us narrow down the list of suspects but we still don’t know who stole the treasure. We have more clues to investigate!

NOTE: Keep your chart for the next activity.

Activity #3: Shoeprints in the Mud

The shoeprints we found in Pirate’s Park were really muddy. It was hard to see any details, but we could tell how big the print was. Let’s see what else we can learn from this clue!

Let’s get started!

Step 1: Measure the clue shoeprint from end to end. Write down the length in inches: _______

Step 2: Measure the clue shoeprint from side to side. Write down the width in inches: _______

Step 3: Go through the suspect cards left from Activity #1 (the suspects who matched the clue water) and see whose shoeprints are the same size as the clue print. One of these is the treasure thief! You can cross out all the rest of the suspects whose shoes don’t match.

We have fewer and fewer suspects—we’re getting close to solving this case!

CRIME CATCHER SCIENCE

When the print is of a bare foot it’s called a footprint. Our clue was made by a shoe, so it’s called a shoeprint. Shoeprints can tell you things about the kind of shoe someone wore, for example, whether it’s a running shoe or a high heeled shoe.

F U N F A C T S:

Detectives can use a footprint to tell how tall someone is. The foot, in inches, tends to be 15% - 18% of a person’s height. To see if this is true, measure your height in inches and multiply that number by 0.15 or 0.18. The amount should equal the length of your foot in inches. Does it?

What you need from your kit:

Suspect cards
Clue shoeprint

What you need to get or use:

Ruler or tape measure
Pencil
Activity #4: The Proof Is in the Fruit

We still have some suspects left. What other clues do we have to catch the thief? What about that half-eaten fruit from the lunch sack? Maybe there’s something we could learn from that. All living things have DNA in them. Maybe whoever ate the fruit left some of their DNA on it.

Let’s get started!

Step 1: Put the bottle of rubbing alcohol in the freezer for 30 minutes.

Step 2: Make a mixture that will help break down the cells inside the fruit:
- Fill the cylinder with water up to the 9 ml mark.
- Then add 1 ml of liquid dish soap, filling the cylinder, up to the 10 ml mark.
- Add a TINY pinch of salt and gently swirl the mixture.

Step 3: Now we have to break down the fruit to get at the DNA in its cells.
- Put your piece of fruit in the small plastic bag.
- Zip the bag shut.
- Mash the fruit by pressing on the bag with your hand. You might need to use a rolling pin or some other tool to make sure the fruit is fully mashed with no big chunks left. Be careful not to tear the bag.

Step 4:
- Open on the bag
- Pour the mixture from the graduated cylinder into the storage bag with the fruit.
- Zip the plastic bag shut
- Shake and mash up this mixture with your hand again for at least two whole minutes.

What you need from your kit:
- Graduated cylinder with cap
- Plastic bag
- Filter
- Rubber band
- Cup
- Test tube and cap

What you’ll need to get or use:
- Rubbing alcohol (the higher the alcohol content the better—minimum 70%)
- Water
- Piece of fruit (Best results are with strawberries, plums, kiwis and tomatoes. Pears and peaches might work. Watermelon and bananas are NOT recommended. Peel the fruit if it has a peel.)
- Liquid dish soap
- Salt
- Spoon or stir stick
- Scissors
- Measuring cup
- Optional: toothpick

Fun Facts:
The first evidence of DNA was discovered in the 1860s! In the 1950s scientists discovered DNA’s structure.
Step 5: Put a coffee filter loosely over one of the cups and use a rubber band to hold it onto the top of the cup. Push the coffee filter down a bit so that it’s not totally tight across the top of the cup—the filter should curve down a little into the cup.

Step 6:

• Using scissors, snip off one corner of the bottom of the zipper lock bag

• Carefully pour the fruit mixture onto the coffee filter covering the top of the cup.

• Leave this alone for at least 10 minutes.

Step 7: Carefully take the coffee filter and everything still inside it off the top of the cup. You won’t see very much liquid inside the cup but that’s okay—DNA is small! Throw away the coffee filter and everything inside it. Be sure to save the liquid in the cup.

Step 8:

• Now take the rubbing alcohol from the freezer and measure out 25 mL—you can use your graduated cylinder to measure.

• Pour rubbing alcohol into the test tube.

• Add the fruit mixture to the alcohol in the test tube and put the cap on.

• Wait 5 or 10 minutes and you’ll have DNA! Let’s make some observations! What does it look like? Does it smell? Can you tell what kind of fruit it used to be?

DNA usually looks like a clump of slimy tiny white threads all balled together. Over time, these threads will float to the surface of the alcohol. You can use a toothpick to pick them up!

We’ve got DNA from the fruit at the crime scene! Since all living things have DNA in them, much of this DNA must be from the fruit itself. But, let’s hope the thief left some too. We’ll send our DNA to the crime lab and see what we discover.

CRIME CATCHER SCIENCE

DNA is short for deoxyribonucleic acid. It’s found in the cells of nearly every living thing, including all plants and animals. DNA stores information, like a blueprint or a code, and carries the instructions to make things such as proteins. Each person’s DNA is different, except for identical twins. If a person’s blood, skin, hair, etc. is left at a crime scene, a DNA sample can often be taken from it to identify that person.

Fun Zone!

Try this activity again to get DNA from other fruits and vegetables. Is all the DNA the same, no matter what you test? Do you notice any differences?
Activity #5: DNA Matching

The DNA results are back from the lab. What do they tell us? As expected, most of the DNA belonged to the strawberry, but they also found some human DNA! The lab sent us a card with the DNA profile on it.

Let’s get started!

Step 1: Take a look at the DNA profile of all 12 suspects. Let’s make some observations! What are some differences you notice in the lines on the profile from each suspect?

Step 2: Now look at the DNA mystery profile the crime lab sent us. Does the DNA profile match any of the suspects’ DNA profile below?

Before we call the police to arrest our suspect, let’s learn some cool crime catcher science!

So, who do you think is the thief?

Ask your Adult Helper to read the Answer from the Adult Helper Guide.

Mystery #2: The Case of the Cursed Cookies

(Note: You’ll need to get a pencil and paper to start the investigation.)

We got a call this morning from our friend, Susannah Sweets, who just opened a new cookie shop. “Help!” she said. “Something terrible has happened. Come quickly!” We never need to be asked twice to come to a cookie shop, especially not when a friend needs our help.

When we got to the store, Susannah opened the door for us. “It’s terrible,” she said. “I’ve been cursed.” “What do you mean?” we asked. “Look,” she said. She showed us a note that she’d found when she opened the shop that morning.

The note read: “I have cursed your cookies and your shop. You will never bake any good cookies here ever again!” The note wasn’t signed.

“Then, when I baked my famous chocolate chip cookies,” Susannah said, “they turned out like this!” She showed us a plate of rock-hard lumps. They looked awful, smelled awful and tasted even worse. Juan tried to eat one and nearly cracked a tooth. “Ouch!”

CRIME CATCHER SCIENCE

The DNA in bits of skin, blood, root hairs or other cells found at the scene of a crime can sometimes be used to identify the person who left it there. To make a DNA “profile,” enzymes are added to a sample of DNA, which breaks the DNA into pieces. Then the pieces of DNA are forced through a gel that separates them according to size. When you shine a special light through the gel, the pieces of DNA light up and look like lines. Each DNA “profile” has a different pattern of lines.

FUN FACTS:

DNA evidence is often used to show if someone did or did not commit a crime. DNA can also help tell you where your ancestors came from.

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We really wanted to help our friend and get our favorite cookies back. “Don’t worry, we’ll get to the bottom of this,” we told her. We asked Susannah who she thought could have left the note and cursed the cookies. She came up with four possible suspects.

**#1 Ivana Cookie** “She’s been a great employee for five years,” Susannah said. “But for the last month, she’s been coming in late and leaving early. I finally had to have a talk with her about being on time. I don’t think Ivana would have cursed the shop, but you never know—no one likes getting in trouble.”

**#2 Charlotte Cake:** Susannah explained why she was suspicious of Charlotte. “Charlotte owns the cookie shop across the street. She acts like it’s a friendly competition, but she’s always trying to out-do my cookies. Charlotte would be pretty happy if I had to close my shop.”

**#3 Gary Granola:** “This guy is a total health food fanatic,” Susannah told us. “He came in the other day and started passing out flyers that said eating too many cookies is bad for your health. That sure didn’t help business. Besides, lots of things are bad for your health if you eat too much of them—a few cookies aren’t so bad, are they? Anyway, I had to have security come and get Gary to leave. He’d probably love it if I lost all my customers.”

**#4 Peter Picky:** “Security had to kick him out of the store too. Not because he hates cookies but because he loves them too much!” Susannah said. “The other day, Peter was in here and started yelling, ‘This cookie doesn’t have enough chocolate chips! It should have 11 chips but it only has 8! And did you use salted butter? I only eat cookies with unsalted butter!’ He just kept yelling about the cookies until we had to make him leave. He might have done this to get revenge.”

To keep track of our suspects and evidence, we decided to make a chart.

<table>
<thead>
<tr>
<th><strong>Cookie Curse Evidence Chart</strong></th>
<th><strong>CLUES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST RESULTS</strong></td>
<td><strong>MARKER</strong></td>
</tr>
<tr>
<td>Ivana Cookie</td>
<td></td>
</tr>
<tr>
<td>Charlotte Cake</td>
<td></td>
</tr>
<tr>
<td>Gary Granola</td>
<td></td>
</tr>
<tr>
<td>Peter Picky</td>
<td></td>
</tr>
</tbody>
</table>
Let's start testing the evidence!

Activity #1: An Inky Situation

The most obvious piece of evidence was the nasty note. Who could have written it? The ink on the note might help us solve the mystery. We did some detective work and learned that Ivana always uses her own special black marker with a white cap. The other three suspects could have written the note using a black marker with a black cap that Susannah had left on the counter in her shop. We asked Susannah to give us a small piece of the note and the two markers.

What you need from your kit:
- Black markers (2—one black cap, one white cap)
- 2 Blank strips from Adult Helper cups
- Cups
- Piece of note from Adult Helper
- Stir sticks (3)

What you will need to get or use:
- Clear tape
- Pencil
- Water

Let's get started!

Step 1: Using your pencil, write a question mark on the top of the piece of the mystery note.

Step 2: Tape the piece of note to a stir stick so that it hangs down from the stick, with the ink on the note hanging away from the stick—the blank end of the note should be attached to the stir stick.

Step 3: Pour a small amount of water into the cup and set the stir stick across the top of the cup. There should be enough water that the bottom of the paper attached to the stir stick barely touches the water. But not so much water that the ink on the paper dips into the water. **Do not let the ink line dip into the water!**

Fun Zone!

Test other felt tip pens to see what colors were mixed to make each ink. Black and brown pens are usually most interesting. If you run out of filter strips, you can use white coffee filters or white paper towels.

Invent a new mystery, and ask a friend or family member to try to solve it using chromatography.
Step 4: Let’s make some observations! What happens to the water? Watch while the water travels up the strip of paper past the ink line. What’s going on with the ink? See what colors and patterns it makes!

Step 5: Wait a few minutes, then take the piece of note off the stir stick and let it dry.

Now that we’ve tested the ink on the note, we can test the markers Susannah gave us from the shop. We’ll see if the ink from one of the markers matches the ink on the note.

Step 6: Take the two blank pieces of filter strips.

- Using a pencil, write “black cap” on one piece of filter and “white cap” on the other piece. (If there’s not enough space, write “bc” and “wc” for short.)

- Then, draw a line near the bottom of the paper with the matching marker—use the black cap marker to draw a line on the piece labeled “black cap” and use the white cap marker to draw a line on the piece labeled “white cap.”

Step 7: Tape the top of each strip to a stir stick just like you did in Step 2, with the line of ink hanging down from the stick. Lay one of the sticks across the top of the cup and hang the strip of paper in the water the same way you did in Step 3. Remember, don’t let the ink line dip in the water. Repeat with the second stir stick. Let’s make some observations! Does the water separate the colors in the ink the same as with the first strip? Are the colors the same or different?

Step 8: Take the pieces of filter off the stir sticks and let them dry. Now look at the strips of paper carefully. Which marker’s ink matches the clue strip from the note?

We’re one step closer to catching the person who cursed the cookies. Cross anyone off your list of suspects who didn’t use the marker that matched the ink on the note.

FINISH YOUR MARKER TESTING BEFORE YOU GO TO THE NEXT PAGE!
Activity #2: Curse Busters

Phew! At least we knew that Susannah’s employee, Ivana, had nothing to do with the curse. That left us with three suspects. We started to wonder not just who left the note, but how they cursed the cookies.

Anita had a brilliant idea. “Maybe there’s no curse. Maybe our suspect did something bad to Susannah’s ingredients and that’s why her cookies are so horrible!” We asked Susannah if we could snoop around her kitchen.

Let’s get started!

We took samples of all of Susannah’s ingredients and they looked all right. But we knew we’d need to test them to be sure. We’ll test Susannah’s ingredients against ingredients we know are okay. Let’s start with the flour and the baking soda, two key ingredients. We know different powders can react in different ways.

**Step 1:** First, let’s find out what the ingredients are supposed to do.

- Measure out a teaspoon of flour and create a small pile on a plate. Then measure out one teaspoon of baking soda and place that on the plate in a separate pile.
- Add one teaspoon of citric acid to each of the piles on the plate. Then add a few drops of water to each pile. Mix together with stir stick, still keep piles separate. Let’s make some observations! What happens when the citric acid mixes with the flour? What about with the baking soda? Write down the results.

  Flour with citric acid_______________________________________

  Baking soda with citric acid_________________________________

**Step 2:** Now let’s double check Susannah’s ingredients. Repeat Step 1 using “Susannah’s flour” and “Susannah’s baking soda.” What happens when the citric acid mixes with the “Susannah’s flour”? What about with the “Susannah’s baking soda”? Did you get the same results as Step 1, or different?

  Susannah’s flour with citric acid: _____________________________

  Susannah’s baking soda with citric acid:_________________________

What did you find out? Does this explain anything?

Before we continue our investigation, let stop for some cool crime catcher science!

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**What you need from your kit:**
- Baking soda
- Citric acid
- Flour
- Stir stick
- “Susannah’s Flour” sample
- “Susannah’s Baking Soda” sample

**What you will need to get or use:**
- Plate
- Water

**CRIME CATCHER SCIENCE**

When citric acid and baking soda get together, a chemical reaction occurs, and one of the products of this reaction is the gas carbon dioxide (or CO₂). This is the same gas that you find in soda pop! When you open a bottle of pop, some of that gas is released and that is what makes it fizz.

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Mixed-up Powders

A-ha! We thought so! Our experiment explained the so-called “curse.” It looked like our suspect switched the ingredients in Susannah’s kitchen. What she thought was flour was really baking soda, and vice versa! No wonder the cookies were so horrible. Now that we know what ruined her recipe, Susannah could get back to baking the delicious cookies we loved so much. But we still have work to do!

Activity 3: Fingerprints Donít Lie

It might have seemed like our suspect will get away with the crime. Not so fast! Before we ran our other tests, we made sure to dust for fingerprints on the marker and the flour and baking soda bins. Now we had fingerprints to help us figure out who wrote the note and switched the powders.

Step 1: First we asked a fingerprint expert to teach us about fingerprints. We learned that fingerprints are made up of tiny lines. Scientists use the shape of these lines to group fingerprints into three general types: arches, loops and whorls. We’ve given you some examples below.

<table>
<thead>
<tr>
<th>Arch</th>
<th>Loop</th>
<th>Whorl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch lines start on one side of the print, go up, then down, and out the other side of the print.</td>
<td>Loop lines start and end on the same side of the print.</td>
<td>Whorl lines are circles that do not go out on either side of the print.</td>
</tr>
</tbody>
</table>

Step 2: Look at each of the remaining suspects’ fingerprints. What differences do you notice? Spend a few minutes noticing everything you can about each print, using the magnifying glass or just your eyes. Be sure to look at the tiny lines, especially in the center of the print. Can you tell which one is an arch, which one is a loop and which is a whorl?

What you need from your kit:
Suspect cards

What you will need to get or use:
Clear Tape (optional)
Magnifying glass (optional)
Pencil (#2) (optional)

FUN FACTS:
We can use prints to help identify animals too! Some people use prints of dogs and horse’s noses to help identify them.

CRIME CATCHER SCIENCE
Each person has a unique pattern of tiny ridges on every one of their fingers. Even identical twins don’t have the exact same fingerprints. Our fingerprints last a lifetime, and since we use our fingers to touch things, we often leave fingerprints behind. There are lots of different marks in a single print. People who study fingerprints try to see how many of these marks are similar between a clue print and a suspect’s print. If the prints are very similar, they probably came from the same person. If they are very different, the prints are probably from different people.
Step 3: Now let’s look at the prints we found on the markers and the bins. Do they match any of the suspects? No two people have the exact same prints, so let’s see whose prints were on both the marker and the bins.

WE’RE DYING TO KNOW, WHO’S OUR COOKIE CULPRIT?

ASK YOUR ADULT HELPER TO READ THE ANSWER FROM THE ADULT HELPER GUIDE.