# Chemical Fingerprinting

**Overview:** Did you know that the patterns on the tips of your fingers are unique? It's true! Just like no two snowflakes are alike, no two people have the same set of fingerprints. In this experiment, you will be using a chemical reaction to generate your own set of blood-red prints.

Fingerprints are unique to each person and there is a sophisticated classification system for identifying all those lines and curves on your fingertips. This lab will teach you how to reveal your own fingerprint using a chemical reaction.

**Materials**

- baking soda or sodium carbonate (washing soda)
- water
- sheet of goldenrod paper
- paper towel
- magnifying lens
- cup

**Experiment**

1. Pour some water into the cup and add some baking soda (or washing soda). Swirl with your finger to mix.
2. Put your right index finger in the mixture and allow the excess water to drip off, and then roll your wet fingerprint on the goldenrod paper. This should leave a bright red fingerprint on the paper. Label it *right index*.
3. Continue the procedure for each finger on both hands to make a full set of prints. Be sure to label each fingerprint as you make it to identify which print goes to each finger. Don't forget to make prints of your thumbs!
4. Use the magnifying lens to check for fingerprint features such as whorls or loops and label them appropriately on your prints.
5. After you have identified the dominant pattern on each of your fingertips, prepare a simple chart for each hand to record the data by finger.
6. When you are finished studying your own prints, ask a volunteer to let you make prints of their fingers.

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| Finger | Pattern |
|---|---|
| right index | |
| right middle | |
| right ring | |
| right little | |
| right thumb | |
| left index | |
| left middle | |
| left ring | |
| left little | |
| left thumb | |

**Reading**

Fingerprints are unique to each individual. Even identical twins have different, although similar, prints. Anyone who's watched a detective movie or read a mystery novel knows that fingerprints have a role in forensics because of their distinct nature. Fingerprints left at the scene of a crime can be compared to a database of known prints for potential matches.

Because each person's prints are unique, there is a sophisticated classification system for identifying all those lines and curves on your fingertips. A mnemonic device for remembering the three main types of fingerprint patterns is LAW: loops, arches, and whorls. Loops start and end on the same side of a finger, arches go from one side of a finger to the other, and whorls are basically circular.

Beyond basics, there are more specific classifications like radial loop, ulnar loop, plain arch, tented arch, central pocket whorl, and more! And these are only the primary classifications. Secondary classification gets down to the minutiae that are highly individualized characteristics of each print.

This experiment crosses over from biology to chemistry. The goldenrod paper is made using phenolphthalein, a chemical that turns red when exposed to materials with relatively high pH. Baking soda (sodium bicarbonate) or washing soda (sodium carbonate) are bases which have a high pH. Rolling your baking soda-covered fingers on the goldenrod paper creates a chemical reaction which produces a red fingerprint.

**Exercises**

1. What are the three main types of patterns on fingerprints? Describe each.
2. How do fingerprints have the potential to help solve crime?
3. Why does baking soda (or washing soda) show up red on the paper?
4. What kind of pH do bases have?
5. What kind of reaction do we see when the red fingerprints show up on the paper? (a chemical reaction)

**Answers to Exercises: Chemical Fingerprinting**

1. What are the three main types of patterns on fingerprints? Describe each. (Loops start and end on the same side of a finger, arches go from one side of a finger to the other, and whorls are basically circular.)
2. How do fingerprints have the potential to help solve crime? (Fingerprints are unique to each individual. Prints from a crime scene can be compared to a database of fingerprints for possible matches.)
3. Why does baking soda (or washing soda) show up red on the paper? (They are bases, which interact with a chemical in the goldenrod paper).
4. What kind of pH do bases have? (bases have a high pH)
5. What kind of reaction do we see when the red fingerprints show up on the paper? (chemical reaction)