LA COUNTY LIBRARY

Activity Idea

SECRET AGENT

INVISIBLE INK & FINGERPRINTING

Recommended for Ages 8 – 12

Have you ever wanted to be a secret agent? Now is your chance! Your mission, should you choose to accept it, is to read about the important science involved in becoming a secret agent and then test your new skills on a Top-Secret Mission. When you have completed your mission, ask for an adult's help and post your results on social media and tag @LACountyLibrary.

Option 1: Classic Invisible Ink

The Science

- Lemon juice is acidic and weakens the fibers of the paper. When heat is applied the remaining acid burns slightly and turns the area where the lemon was applied brown.
- What other liquids do you think might work?
    - Orange or other citrus juice, vinegar, milk, apple juice

You will need the following materials:

- Lemon juice - a few teaspoons will work
- Small bowl
- Paint brush or cotton swab
- Paper
- Hair dryer (optional)

Directions

1. Squeeze some lemon juice into a bowl. Dip your paintbrush or cotton swab in and write your secret message on the paper.
2. Let the paper dry completely
3. Once dry, (with the help of an adult) run a hair dryer at low speed and high temperature back and forth over the page and watch the message reappear! Be patient as this can take a few minutes. Alternatively, if it is a very sunny day, leave the page outside in full sun until the message becomes visible.

Option 2: Self-Destructing Invisible Ink Message

The Science

- "pH" (potential of hydrogen) is a scale of acidity that runs from 0 – 14, telling how acidic or basic a substance is. If a substance is more acidic it has a low pH, if it is more basic it has a higher pH.
- A pH indicator is a compound that changes color depending on if it is exposed to a base or an acid (hydrangea plants for example will turn more blue if their soil is more alkaline, or pink if their soil is more acidic).
- The pigment in juice is called anthocyanin and is a pH indicator, it both serves to give the juice color and, in this case, reacts with the alkalinity (a base) of the baking soda.

You will need the following materials:

- Plain white paper
- Baking soda
- Water
- Dark colored juice (like grape or cranberry)
- Paintbrush or Cotton swap

Directions

1. Mix water and baking soda in equal amounts (1:1 ratio), only a few tablespoons are needed. Mix well.
2. Using your paintbrush or cotton swab, write your message on the white paper. Let the paper dry completely.
3. Use the paintbrush again or the clean end of the cotton swab, gently paint the juice onto your message and watch it appear!

Note: This message will "self-destruct" by fading shortly after exposure

Fingerprinting

You will need the following materials:

- Pencil
- Scrap paper to scribble on
- Database page printed or other piece of paper to save fingerprints
- Clear tape
- Your fingers

Directions

1. Using the pencil, color a dark splotch on a piece of paper, then rub one fingertip on the splotch so the graphite colors your whole fingerprint.
2. Carefully tear off a piece of tape and press it onto your finger, covering the whole splotch, gently lift the tape away from your fingertip.
3. Place the tape onto your database page. Repeat with on thumb and all remaining fingers.
4. Repeat for opposite hand and anyone else in your family!

The Science

- Every fingerprint is unique; this is because fingertips have ridges that create a certain pattern. There are three main types of fingerprint patterns called loops, whorls, and arches.
    - Can you see which kind make up your fingerprints? Try this with a family member. Do their fingerprints look similar or different to yours?
- Fingerprint patterns can be like close genetic relatives; however, the identifying ridges will always be completely unique. Even identical twins who share DNA, cannot have the same fingerprints.

Read more on Overdrive

Chemistry by Carla Mooney, https://tinyurl.com/ybvs34np
30-Minute Chemistry Projects by Anna Leigh, https://tinyurl.com/yc39snoq
Spy School by Stuart Gibbs, https://tinyurl.com/y87h6xe9
The Boxcar Children: Spy Game by Gertrude Chandler Warner, https://tinyurl.com/y8fgm3ja
Nurse, Soldier, Spy by Marissa Moss, https://tinyurl.com/ya55o7nj
Forensics by Anita Yasuda, https://tinyurl.com/y8cuvfm7
The Purple Fingerprint by Carolyn Keene, https://tinyurl.com/y78camao
World War II Spies and Secret Agents by Stuart A. Kallen, https://tinyurl.com/y9o667gp

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FINGERPRINT DATABASE

Right Hand

Thumb	R. Index	R. Middle	R. Ring	R. Pinky

Left Hand

Thumb	L. Index	L. Middle	L. Ring	L. Pinky