

the science of...  
**SPYING**

## Make invisible ink

Spy tools – Inventing, designing and making

### Purpose

To engage younger students in Art & Design and chemistry using everyday objects.

### Age range (years)

7 8 9 10 11 12 13 14 15 16



### Subjects

Art & Design,  
Science (esp.  
chemistry)



## Background

This activity engages younger children in chemistry – via everyday objects and the fun of hiding messages (something that spies are often required to do).

Note: Invisible ink is one application of steganography. Also see the 'How to hide a message' activity.

## Steps

### You will need:

- paper for each student
- a lemon for each student from which to squeeze their 'ink'. (You could buy squeezed lemon juice. This is easier but less fun.)
- knives
- small bowls for holding lemon juice
- something to write with for each student – cotton buds or small paintbrushes work well
- heat sources for revealing the hidden messages – high wattage filament bulbs or fan heaters are safest.

Demonstrate how to create a message.

1. Cut a lemon in half and squeeze the juice into a bowl.
2. Using the lemon juice, write a simple message on a piece of paper, perhaps: "If life throws you a lemon, make lemonade!"

3. Hand out the activity sheets and ask students to write their own messages.
4. While messages are drying ask:
  - why might someone want to write an invisible message?
  - how do you think the message you have written could be read by someone else?
5. Once your own message has dried, expose the paper to the heat source to reveal it.
6. Now ask the class to pass their messages to each other to be revealed in the same way.
7. Explain the process at work. Acid in the lemon juice slightly weakens the paper, which then burns (and turns brown) quicker than the surrounding areas.

## Extensions

Ask students to research other methods of invisible writing and printing. e.g. inks that become visible when exposed to the air, or to ultra-violet light.

For older students: Ask them to research the pH scale for measuring acidity using litmus paper to discover how acidic their lemon juice is, and perhaps comparing it to alkaline and neutral liquids.

## Make invisible ink – activity sheet

1. Cut a lemon in half.
2. Squeeze as much juice as you can out of the lemon.
3. Using your writing tool write an invisible message on your paper with the lemon juice. Don't make it too long or you'll run out of juice!
4. Wait for the message to dry.
5. Once your message has dried swap it with a classmate.
6. Place the paper close to the heat source provided by the teacher. Write down the message revealed in the box below.

