



Space secrets
Check out the film we made of Scout Ambassador and astronaut Tim Peake demonstrating how to write and decode messages in invisible ink:
youtu.be/9N-iO6dMboc.

Send a secret message

Use vinegar to make invisible ink and write secret messages to share with your friends

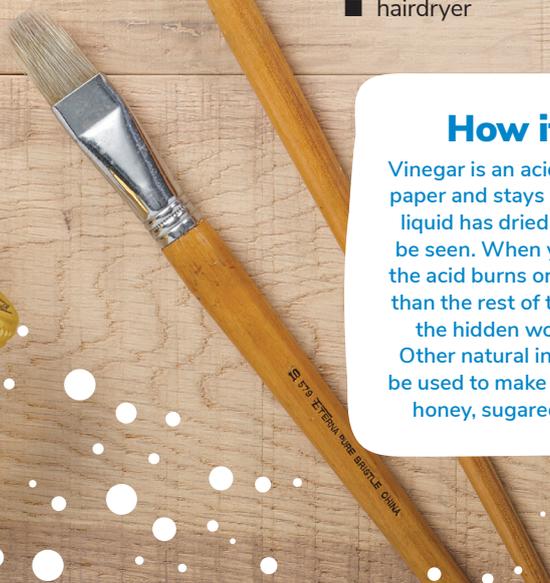
People have been inventing and using invisible inks for hundreds of years, to communicate with each other while keeping important information from falling into the wrong hands. During the first world war, spies used lemon juice to share details about troop movements. Today we use security marker pens to add personal details to valuable property. UV light can then be used to reveal these details.

You will need

- white vinegar
- lemon juice
- cups
- plain paper (unbleached works best)
- paintbrushes
- string
- clothes pegs
- hairdryer

How it works

Vinegar is an acid. This weakens the paper and stays on it, even after the liquid has dried and can no longer be seen. When you heat the paper, the acid burns or turns brown faster than the rest of the paper, revealing the hidden words or markings. Other natural ingredients that can be used to make invisible ink include honey, sugared water and milk.



Can
you read
this?



Did you know?

Robert Baden-Powell was reputed to be an occasional spy who used coded messages. Undercover, he sent sensitive military information disguised within the markings of a butterfly's wings. Find out more in his book, *My Adventures as a Spy*.

Time needed
35 minutes

Badges



Rolls-Royce partners the Cub and Scout Scientist Activity Badges

Partner



Outcomes

Young people will learn about chemical reactions and how acidic materials are affected by heat.

Taking it further

Try making invisible ink with other natural ingredients and test their effectiveness. Which method is best?

More information

For more badge resources, activity sheets and safety guidance visit: scouts.org.uk/rollsroyce.

Suitable for Cubs and Scouts

Instructions

1 Prepare your meeting place with two spaces: one with tables and chairs for a writing activity, and another with a table close to an electrical outlet for plugging in the hairdryer. Tie the string between two chairs to create a line to hang the secret messages on.

2 Using the information on this page, talk to your section about the reasons people have used invisible ink, and explain the science behind it.

3 Task each young person with creating their own invisible messages: make a solution that is half

vinegar, half lemon juice, then dip their paintbrushes in to write on the paper.

4 Once the liquid has dried, each young person can swap their paper with someone else. They then need to peg the messages onto the string and use the hairdryer to warm the paper and reveal the message. Make sure care is taken and young people are supervised when using the hairdryer, and keep liquids away from electricity.

5 Add water or more lemon juice and run the experiment again to see how this affects the clarity of the message.