



## Secrets - How can I see the missing words?

### Fact

- The missing words in that message were written with lemon juice. When lemon juice dries it becomes invisible.
- Heat causes a chemical reaction in the dry lemon juice and makes the juice turn brown.
- By heating the message in the microwave for a few seconds the juice heated up and turned brown so I could see the missing words.
- The browning of the juice is called oxidisation and that's what happens to cut fruit when it turns brown.
- The oxygen in the air reacts with substances in the fruit and causes a chemical reaction and that turns the fruit brown

### Do you know

- "Invisible Ink" messages were used hundreds of years ago when people sent secret messages – except they didn't have microwaves then so they heated their messages over a candle or a fire.

### Experiments you can do

Write your own secret message.

#### What you need:

The help of an adult

The juice of a lemon

A cotton bud

Some plain white paper

A microwave

#### What you do:

Use the cotton bud as a pen by dipping it in the juice. Keep dipping the cotton bud in the juice as you write your message. Leave the message for a couple of hours to let it dry. See if anyone can read the message – test an adult and see if they can see it! Then get them to help you with the microwave and show them how the message comes through. Get them to heat the paper a few seconds at a time until the lemon juice browns and you can see the words. Tell the adult to be very careful using the microwave and not to heat the paper for too long at a time.

### Other Investigations

Oxidisation.

Have an adult cut an apple in half and eat one of the halves – yummm. Leave the other half on the bench. Check the time and come back in 5 minutes to see if a chemical reaction has started to happen with the oxygen in the air and substances in the apple. The chemical reaction is oxidisation and will turn the cut surface of the apple brown. How long does it take to go brown? Then get an adult to carefully trim the brown surface off. Is the whole apple brown now or just the surface?