

Student Sheet

In this practical I will be:

- Learning and using key words, such as **insoluble**, **stabilised**, **pigment**, **vehicle**, **acidity**, **humectants**, **opacity**, **permanence** and **tack**.
- Making inks from tea and discussing whether different types of tea produced different colours of ink.
- Observing the effects of adding a stabiliser to my tea and determining its purpose.
- Analysing the similarities and difference between brown and herbal tea ink when exposed to light (over a period of time).

Introduction:

As a science-artist in prehistoric times during the Bronze Age it's your job to make the inks for the paintings. You will record your tribe's accomplishments and another person, a Druid (a priest) has indicated you could use plant dyes.

Up until recently your tribe had only used black ink made from charcoal, but you decide that a different coloured ink can be made from certain plants such as galls from the oak tree.

You decide to investigate further...

Equipment:

For each pupil or pairs:

- 4 teaspoons of loose tea or 4–5 teabags (a safe substitute for galls)
- 1 teaspoon gum arabic 'crystals' or 3 teaspoons of gum arabic liquid
- 1 cup
- 1 spoon
- 2 straws
- Scissors
- A4 paper
- 1 fine sieve (if using tealeaves)
- 1/2 cup near boiling water
- 1 screw top bottle or other container to store the ink in

Method:

If your teacher has already provided you with the cooled liquid tea then start from step 3.

1. Pour the hot water over the tea bags in a cup until it is half full.
2. Stir with your spoon and then leave the tea bags in the hot water for about 15 minutes during which time it will also cool ready for the next step.
3. Use the scissors to make a diagonal cut on one end of a straw to make a nib. Make two of these and put them to one side ready to use for writing.



4. Use the spoon to squeeze as much tea extract (tannin) as possible from the tea leaves or teabags.
5. Throw away the tea bags. Keep the tea solution.
 - Why was hot water used?
 - Do you think you could get the same result with cold water?
 - Describe the tea solution.
 - Why were the tea bags allowed to stay in the water for so long?
 - What was the purpose of squeezing the bags with a spoon?
6. Dip the end of your straw you have already cut (the nib) into your tea solution and try writing on the paper with it.
7. Put the gum arabic 'crystals' (or 3 teaspoons of the liquid) into the brown tea solution. Use the spoon to stir the solution to mix in the liquid or to dissolve as much gum arabic as possible. Stop when no more dissolves.
 - Describe the result of putting the gum arabic into the tea solution.
 - Is it different from the original tea solution? How?
 - Find out the purpose of adding the gum arabic to the tea.
8. Dip the end of the other clean straw you have already cut (the nib) into the ink solution and use it to write on your paper.
9. Strain the ink through a fine sieve and allow it to cool before bottling it in a screw topped bottle.
10. It can be kept for a short while to use for writing. Try using the ink to write a letter to your teacher.

Going further:

Use the ink for to write the same message on two separate pieces of paper.

Describe the opaqueness, permanence and tack of the ink.

Expose one of the pieces of writing to bright sunlight and put one in the dark. Leave for a week.

Describe what happens to the colour of each.

Make up different coloured inks using tea and herbal teas.

Describe the colour of each. With each different ink expose them to light and dark.

Describe the opaqueness, permanence and tack of the ink.

Which ink keeps its colour longer, the brown tea ink or the herbal tea ink?



Theory:

The hot water **dissolves** the chemical caffeine from the tea. This takes place very quickly. The caffeine is not the important component for the ink. What are required are the coloured chemicals known as tannins. The longer the tea bags are **infused** the more the tannins will be released which is the chemical that makes the brown ink. The gum Arabic acts as the binder to 'glue' the ink onto the page.