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| **Making invisible ink** | | | |
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| Learn how to make invisible ink | | | |
| **Subject(s):** Design & Technology, Science  **Approx. time:** 40 – 60 minutes |  | | **Key words / Topics:**   * Invisible * Ink * Heat * Lemon juice * Substance |
| **Suggested Learning Outcomes** |  | |  |
| * To know that some substances change colour when heated * To be able to make invisible ink from lemon juice * To be able to write secret messages | | | |
| **Introduction** |  | |  |
| This is one of a set of resources developed to support the teaching of the primary national curriculum. They are designed to support the delivery of key topics within Mathematics and Design & Technology. This resource is part of a group for the Summer that could be carried out either in school or at home. It involves using lemon juice to make invisible ink. | | | |
| **Purpose of this activity**  In this activity learners will make invisible ink from lemon juice mixed with water. Learners will also have the opportunity to write secret messages to their friends, then use heat to reveal the messages.  This activity could be used as a main lesson activity, to teach learners about how substances can change colour when heated. | | | |
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| **Activity** |  | | **Teacher notes** |
| **Introduction (5-10 minutes)**  Teacher to explain that learners are going to make invisible ink from lemon juice and use this to write secret messages.  **Invisible ink activity (20 - 40 minutes)**  Teacher to demonstrate the steps shown in the teacher presentation and listed below, then learners to carry out the activity:   * Step 1 – Learners to squeeze the juice of half a lemon into a bowl. Add a few drops of water and mix with a spoon. * Step 2 – Learners to dip a cotton bud into the mixture and write a message onto white paper. Wait for the juice to dry and turn invisible. * Step 3 – Learners to heat the paper either using a hairdryer or next to a warm lamp bulb. The message will turn brown and be revealed. * Step 4 – Learners to use invisible ink to write a secret note to a friend. Then they should ask their friends to read and reply to the message.   **Review (5-10 minutes)**  Peer review – learners to share their experiences of making invisible ink. Did the invisible ink work? What made the lemon juice appear when heated? |  | | Teacher should cover areas where lemon juice and water will be mixed.  Step 1 - Teacher should cut lemons in half prior to the learners squeezing them. If lemons not available use bottled lemon juice.  Step 3 – Teacher to demonstrate how to safely warm the paper with either a hairdryer or next to a warm lamp bulb. If no heat source is available the paper messages may be left in direct sunlight, although this takes a lot longer and the writing may be fainter. |
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| **Differentiation** |  | |  |
| **Basic** |  | | **Extension** |
| * Provide pre-mixed lemon juice and water. * Provide learners with paint brushes instead of cotton buds. |  | | * Learners to write longer notes to their friends and see if their friends can read them. * Watch video: **YouTube** – Real Science how to make invisible ink: <https://www.youtube.com/watch?v=zgADu8ZMyd0&t=103s>. Other ways to make invisible ink. |
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| **Resources** |  | | **Required files** icon-docicon-pdficon-ppt |
| * Lemons of bottle of lemon juice * Water * Small bowls * Cotton buds/paint brushes * White paper * Hairdryer or lamp |  | | icon-ppt Teacher presentation – Making invisible ink |
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| **Additional websites** |  | |  |
| * **YouTube** – Invisible ink: <https://www.youtube.com/watch?v=eWcEGpHcqXE> * **YouTube** – Real Science how to make invisible ink: <https://www.youtube.com/watch?v=zgADu8ZMyd0&t=103s> | | | |
| **Related activities (to build a full lesson)** |  | |  |
| **Starters** (Options)   * Show the video: **YouTube** – Invisible ink: <https://www.youtube.com/watch?v=eWcEGpHcqXE> | | **Extension** (Options)   * Learners to write longer notes to their friends and see if their friends can read them. * Watch video: **YouTube** – Real Science how to make invisible ink: <https://www.youtube.com/watch?v=zgADu8ZMyd0&t=103s>. Other ways to make invisible ink.   **Plenary**   * Peer review – learners to share their experiences of making invisible ink. Did the invisible ink work? What made the lemon juice appear when heated? | |
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| **The Engineering Context** film |
| Engineers are able to use colour changing chemicals to show that something is present. For example, bioengineers working with soil use litmus paper to use see if the soil is acidic. Blue litmus paper turns red when it is placed in acidic soil. Materials engineers have created smart materials that can change their properties – for example, thermochromic pigment is used in food packaging to change colour when the food is heated to the correct temperature. |

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| **Curriculum links** | |
| **England: National Curriculum**  KS2 Science  States of matter   * observe that some materials change state when they are heated or cooled | **Northern Ireland Curriculum**  KS1&2 – Science and Technology  Change over time:   * changes that occur to everyday substances, for example, when dissolved in water or heated and cooled |
| **Scotland: Curriculum for Excellence**  Science  Chemical changes   * SCN 2-19a | **Wales: National Curriculum**  Science  The sustainable Earth:   * the difference between physical and chemical changes using common examples |
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| **Assessment opportunities** | | |
| * Informal teacher assessment of the practical activity. | | |
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