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| **Chromatography Christmas tree** | | |
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| **Stay safe** |  |  |
| Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for:  • ensuring that any equipment used for this activity is in good working condition  • behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others  Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol: ⚠ | | |
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| **Age range:** 11-14-year-olds or younger with adult supervision  **Approx. time:** 45 minutes – 1 hour |  | **Key words / Topics:**   * chromatography * mixtures * pigment * soluble |
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| **Introduction** |  |  |
| In this activity learners are going to make fun and colourful Christmas tree decorations and find out more about chromatography – one of the ways they can separate mixtures. | | |
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| **Equipment** ⚠ |  |  |
| * Coffee filters * Washable felt tips * A spray water bottle * Lolly sticks or wooden pegs * Some yellow or metallic card * Scissors * Sticky tape or a glue stick | | |

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| **Instructions** ⚠ |  |  |
| **Step 1**  Fold a coffee filter flat so it makes a triangle shape. Colour it with the felt tips in any way desired – learners can colour it in totally or leave spaces. They can also experiment with different patterns.  **Step 2**  Use the spray bottle of water to spray the coffee filter until it is wet. It doesn’t need to be dripping wet – damp is fine!  **Step 3**  Leave the coffee filter to dry. Learners should see the felt tip markings combine into a colourful pattern.  **Step 4**  A wooden clothes peg can be attached at the bottom to make the Christmas tree trunk. Alternatively sticky tape could be used to attach a lolly stick trunk instead.  **Step 5**  The finishing touch is to add a star made of yellow or magnetic card. | | |

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| **Science and maths** |  | |  |
| A **mixture** is two or more substances combined together. **Chromatography** is a technique used to separate mixtures. The mixture is passed through another substance, in this case the filter paper. The different colour ink particles travel at different speeds through the filter paper allowing us to see the constituent colours of the pen ink.  Different colours move at different speeds due to the way each colour is made up. Although felt tips might all look alike, in fact the **pigment** (that’s the colourful ingredient) may itself be more or less **soluble** than other colours. If the pigment is more soluble it will combine with the water more easily and travel with the water along the filter paper. If it is less soluble it is more likely to stick to the filter paper and not travel so far.  Pigments are the magic ingredient which give our felt tips and paints their unique colours. The pigments used in things like felt tips and paints are usually created synthetically in laboratories. However, in the past, some would have been sourced from some very strange places! If you were a painter who wanted black or brown paint, you might have used burnt wood or charcoal. There was even a paint shade called Mummy Brown which was made from ground-up Egyptian mummies. It was sold until 1964 when the manufacturers ran out of mummies!  In the past painters would also have used a type of lead for its yellow pigment – which was not a great idea because lead is poisonous. A beautiful blue paint was created from the precious stone Lapis Lazuli – it was so valuable that painters would charge more if their subjects wanted to have that colour in their portrait! One of the rarest colours of all was Tyrian Purple – which was extracted from SNAILS! It was so rare that it was only used for the paintings, or for dyeing the fabric of the clothes of the very rich. A more common colour was carmine – a deep red, which was made from crushing the cochineal beetle. You might think that sounds like something from the past, but carmine is still used today in paints, makeup, drugs and even food! | | | |
| **The Engineering Context** | | | |
| Chromatography can help environmental engineers determine the chemicals in polluted water/air, or if there are any new (toxic) chemicals present due to chemical reactions that occurred. They can then use this information to come up with a solution as to how to reduce the polluted effects. | | | |
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| **Curriculum links** | | | |
| **England: National Curriculum**   * **Science: upper KS2** * Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. | | **Northern Ireland Curriculum**   * **Primary: Change over time** * Some mixtures can be separated. | |
| **Scotland: Curriculum for Excellence**   * **Science third** * I have helped to design and carry out practical activities to develop my understanding of chemical reactions involving the Earth’s materials. I can explain how we apply knowledge of these reactions in practical ways. | | **Wales: National Curriculum**   * **Science Year 5 The Sustainable Earth** * The physical and chemical properties of some elements, compounds and mixtures and how mixtures can be separated by simple techniques. | |