

**Pioneer Federation**  
**Medium term plan**  
**UKS2 cycle 1, Term 6**  
**Science**

**Subject:** Science

**Key Concept/ Theme:** Properties and changes of materials

- **Prior Learning links:**

Follow on from Term 1 learning

KS1: Name, compare and identify properties of everyday materials thinking about their suitability for the purpose.

Year 3: compare and group rocks based on appearance and physical properties. Learn how fossils are formed. How soils and rocks are made from organic matter.

- Year 4: Compare and group materials together, according to whether they are solids, liquids or gases
- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

**Vocabulary:**

**Thermal conductivity** – thermal conductor, thermal insulator

**Electrical conductivity** – electrical conductor, electrical insulator

**Dissolving** – Solvent, solution, solute, soluble, insoluble, solid, liquid, particles, suspensions

**Separating materials** – Sieve, filter, evaporate, condense

*soluble* - a substance that will dissolve in water

*insoluble* - a substance that will not dissolve in water

*saturation* - the point at which no more solute can be dissolved

*solution* - a soluble solid is dissolved in liquid to form a solution

*filtration* - the collection of larger particles in a mixture

*boiling* - the process by which molecules of a liquid change to vapour (much faster change than evaporation)

*condensing* - the change of vapour into a liquid

*evaporation* - change from a liquid to a vapour

*freezing* - the change of a liquid to a solid

*melting point* - the point at which a solid substance liquefies

*chemical change* - one where the molecular structures of the combined substances are broken down and recombined to make a new substance

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**physical change** - where the molecular structures of the combined substance stay separate, allowing separation to occur

**reversible change** - a physical change that we can undo

**irreversible change** - a physical change that we cannot undo

1.	<p><b>Deeper learning question for the term:</b> How do materials change?</p> <p><b>Prior learning reconnection (year group, cycle &amp; term):</b> Year 4 cycle year 3 cycle</p> <p><b>Enquiry skill:</b> fair test, record results, graphs</p> <p><b>LO:</b> Let's understand that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.</p> <ul style="list-style-type: none"><li>• Resources: Metal bowls (e.g. dog bowls)</li><li>• Sand</li><li>• Nightlights</li><li>• Nightlight holders</li><li>• Small metal trays</li><li>• Mirrors</li><li>• Clingfilm</li></ul> <p><b>Activity:</b></p> <p>Recap what they learnt in term 1.</p> <p>Simple test – Separating through evaporation</p> <p>Discuss with children what happens to the water on the playground over time.</p> <p>Drama – In small groups the children could use drama to demonstrate their understanding of changing states. Provide them with following vocabulary: 'solid, liquid, gas, add heat, reduce heat (cool), melt, evaporate, condense and solidify.' (They should have learnt much about changes of state in Lower Key Stage 2).</p> <p>Ask the children to think about how there understanding changing states could assist them when trying to work out how to separate water from salt.</p> <p>The children could try heating a mixture of salt and water in a small metal tray on a night light holder. They can try to condense some of the water vapour onto a mirror. The salt can be views under the digital microscope.</p> <p>Problem-solving – How could you separate water from salt if your only heat source was the Sun?</p> <p>The children could try modelling their ideas by:</p> <p>Placing a few centimetres of salty water in a mixing bowl.</p> <p>Place a small beaker in the centre of the beaker.</p>
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	<p>Stretch some Clingfilm over the opening of the bowl and place a weight in the middle of the Clingfilm (thus making it dip above the small beaker). They could then either try heating the mixture with a lamp or they could leave this equipment outside on a sunny day. The water should evaporate, and then condense on the Clingfilm, before dripping into the small beaker below the Clingfilm.</p> <p>Recording</p> <p>The children could draw how they set up their equipment. They can use words and arrows to explain what happened over time.</p>
2.	<p><b>LO:</b> Let's learn to be able to explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</p> <p><b>Enquiry skill:</b> take measurements, record results</p> <p><b>Resources:</b></p> <ul style="list-style-type: none"><li>• Plaster of Paris</li><li>• Egg white</li><li>• Vinegar</li><li>• Bicarbonate of soda</li><li>• Data-logger with temperature probe</li><li>• Clingfilm</li></ul> <p><b>Activity:</b></p> <p><b>Simple tests – Which changes cannot be easily reversed?</b></p> <p>Start by recapping some of the changes that they have already experienced; changes of state, dissolving and making mixtures. Ask them whether these changes could be reversed. These examples that they have studied are all changes that can be reversed.</p> <p><b>Hook</b> – Show the video below and ask the children to note down the different changes that they see and whether they think these can be reversed:</p> <p><a href="http://www.bbc.co.uk/learningzone/clips/changes-in-the-state-of-materials-clip-compilation/2286.html">http://www.bbc.co.uk/learningzone/clips/changes-in-the-state-of-materials-clip-compilation/2286.html</a></p> <p><b>1. Simple test – What happens when we mix water with plaster of Paris? Can you separate them?</b></p> <p>Place around 2cm deep of plaster of Paris in the bottom of a plastic cup. Slowly add water. Measure the temperature change with a thermometer or temperature probe attached to a data-logger (wrap in Clingfilm to prevent the plaster of Paris sticking to it). Make sure that you remove the temperature probe before the plaster sets! The children should observe a change in temperature as the heat is released in this reaction. Make sure you test this beforehand to find out how long was required for the reaction to make a significant change to the temperature.</p>

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	<p><b>2. Simple test – What happens to egg white when it is heated?</b></p> <p>Children can use the same equipment as outlined in the test above when trying to evaporate water. The egg white can be placed in the metal tray, which in turn will sit on the nightlight holder above a flame.</p> <p><b>3. Simple test – What happens when we mix bicarbonate of soda with vinegar?</b></p> <p>The children can explore adding different amount of vinegar to bicarbonate of soda.</p> <p><b>Recording</b></p> <p>For each of these simple tests, the children can draw the before and after stages. They will also need to indicate whether or not they think the change is reversible.</p>
3	<p><b>Lesson could be conducted during Forest school if you have a fire circle</b></p> <p><b>LO:</b> Let's learn to be able to explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</p> <p><b>Enquiry skill:</b> method and equipment, safely using equipment, take measurements,</p> <p>Resources: things to burn, and items to hold to burn pegs and metal knitting needles, metal bowls with sand in</p> <p><b>Activity:</b></p> <p><b>Simple test – What happens to a material when it burns?</b></p> <p><b>Health and Safety</b> – Begin by demonstrating to the children exactly how they are being expected to burn the materials. Do not use anything that gives off a dark smoke.</p> <p>Allow children to burn small pieces of material on pins attached to corks on the end of metal knitting needles (alternatively wooden pegs attached to metal knitting needles) – stamp out in sand if it begins to burn. These must be held a few centimetres above sand within the metal bowl. They only need to be 2cm squared at most. E.g. cereals, pasta, crackers, dead matches, wool, birthday candle, paper, etc.</p> <p><b>Recording</b></p> <p>The children could record the following observations/measurements in a chart: how easy it was to ignite, how it changed, smells, time it burnt for, and what was left.</p>

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4	<p><b>LO:</b> Let's learn to be able to explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</p> <p><b>Enquiry skill:</b> Scientific questioning, make predictions</p> <p>Resources: Glass jar, Candle</p> <p><b>Activity:</b>  <b>Deep thinking time – Where does the water come from? How was the flame extinguished?</b>            Place a glass jar over a burning candle and observe. Droplets of water should be seen condensing inside the glass. The candle may be extinguished by another gas (carbon dioxide). Can the children explain where the water came from and why the candle was extinguished?  <b>Drama/modelling</b> – Although we do not often talk about elements with children, this might be an experience that can be enhanced by knowing a little about them. Candles are composed of hydrocarbons (hydrogen and carbon elements). When burning occurs these combine with the oxygen that is in the air – forming water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>). Thus, about a third of the class can wear 'O' labels, a third 'H' labels and a third 'C' labels. When burning occurs the 'O' children can combine in the right amounts with the 'C' children and the 'H' children; i.e. two 'O' children with each 'C' child, and one 'O' children with two 'H' children.  <b>Recording</b>            The children can draw their burning candle; using words around their drawings to explain what is happening.</p>
5	<p><b>LO:</b> Let's learn to be able to explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</p> <p><b>Enquiry skill:</b> make predictions, take measurements</p> <p><b>Resources:</b>            Small pots with push down lids (e.g. Benecol yoghurt drink pots)            Syringes            Beakers            Stop watches            Different types of household liquids: e.g. salad cream, vinegar, shower gel, milk shake, coke, etc</p> <p><b>Activity:</b>  <b>Investigative fair test – What affects how quickly carbon dioxide is created in the reaction between a vitamin tablet and water?</b></p>

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Explore – The children should add a piece of an effervescent vitamin tablet to a beaker of water. Ask them to explain what the bubbles are and where they came from. Now ask the children to part fill with water a small container with a push down lid (e.g. a Benecol yoghurt drink container). The children can then place a whole vitamin tablet into the container, and then quickly push down the lid. After a short while the lid should pop off. To control the mess, do this investigation in a tray.

The children can then use fair-test posters and post-its to plan their own fair test. The children could choose to change: the amount of tablet, the temperature of the water (obviously not too warm as this water will spread when the lid launches), the type of liquid, the type of tablet or the amount of water. They should use a stop watch to measure how long the reaction takes until there is enough gas to blow the lid off.

**Recording**

The children should record their own fair-test question – e.g. ‘Does the type of liquid affect the time that it takes the lid to pop off?’ They could also record their results and their explanation of any patterns in these results.

**Things to note:**

For a 6 week term 4 lessons and an assessment

For a 7/8 week terms 5 lessons and an assessment

**Adaptions:**

- Use of floor book to show the class learning during the term
- Consider taking photos of pupils completing work on big pieces of paper.
- Take the children outside of the classroom to look at plants in the outside spaces, have some flowers growing in your outdoor area.