

## KS2: MEDIUM TERM PLANNER

### Properties and changes of materials Y5

Pupils should be taught to:

- compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets
- know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
- use knowledge of solids, liquids, and gases to decide how mixtures might be separated, including through filtering, sieving, and evaporating
- give reasons, based on evidence from comparative and fair tests, for the uses of everyday materials, including metals, wood, and plastic
- demonstrate that dissolving, mixing and changes of state are reversible changes
- 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.

The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships, and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.



'Working and thinking scientifically' is described separately at the beginning of the programme of study but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read, spell, and pronounce scientific vocabulary correctly.

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes, and skills through the teaching of the programme of study content:

planning different types of scientific enquiries to answer questions, including recognising, and controlling variables where necessary


taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate

recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar, and line graphs


using test results to make predictions to set up further comparative and fair tests


reporting and presenting findings from enquiries, including conclusions, causal relationships, and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations


identifying scientific evidence that has been used to support or refute ideas or arguments


<p><b>Prior Learning:</b></p> <ul style="list-style-type: none"> <li>Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper, and cardboard for particular uses. (Y2 - Uses of everyday materials)</li> <li>Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting, and stretching. (Y2 - Uses of everyday materials)</li> <li>Compare and group together a variety of everyday materials because of whether they are attracted to a magnet and identify some magnetic materials. (Y3 - Forces and magnets)</li> <li>Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter)</li> <li>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). (Y4 - States of matter)</li> <li>Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter)</li> </ul>		<p><b>Future learning:</b></p> <ul style="list-style-type: none"> <li>Chemical reactions as the rearrangement of atoms. (KS3)</li> <li>Representing chemical reactions using formulae and using equations. (KS3)</li> <li>Combustion, thermal decomposition, oxidation and displacement reactions. (KS3)</li> <li>Defining acids and alkalis in terms of neutralisation reactions. (KS3)</li> <li>The pH scale for measuring acidity/alkalinity; and indicators. (KS3)</li> </ul>	
<p><b>Key Questions</b> (<i>show how content and concepts link</i>)</p> <p><b>Differentiated Learning Objectives</b></p>	<p><b>Teaching and learning activities</b> (<i>linked directly to objectives</i>)</p>	<p><b>Resources</b> (<i>to help pupils reach the learning objectives</i>)</p>	<p><b>Written and non-written outcomes</b> (<i>assessment including homework's</i>)</p>
<p><b>1) What are the properties of different materials?</b></p> <p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class? What do we know about Planet Earth?</i></p> <p><b>Science Working scientifically Skills:</b></p> 	<p><b>Science reasoning task: explorify:</b> <a href="#">Bright spark - Explorify</a></p> <p><b>Activity 1:</b> PowerPoint go through and discuss and identify what the different materials are and what possible properties could be (make a list). (Y2+Y4 Flashback)</p> <p><b>Activity 2:</b> Plan experiment – (method/ enquiry question for each given) pupils to make predictions, record and conclude.</p> <p><b>Activity 3:</b> pupils to share results and conclusions. If there are differences in results discuss why that might be?</p>	<p><b>Activity 1:</b> Pupils post it notes of materials and properties.</p> <p><b>Activity 2:</b> Pupils use planning template.</p> <p><b>Activity 3-</b> sharing pupil results.</p>	<p><b>Assessment:</b> Are pupils able to record results?</p> <p><b>Homework:</b> make a list of different objects around the house and see what materials are used to make them. What property does that material have that makes it suitable?</p>


<p><b>Science Enquiry Type</b></p> <p><b>Comparative</b></p> <p><i>Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.</i></p> <p><i>Mixtures can be separated by filtering, sieving and evaporation.</i></p> <p><i>Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.</i></p>	<p><b>Misconception:</b></p> <p>Some children may think:</p> <p>Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.</p> <p>Some children may think:</p> <ul style="list-style-type: none"> <li>• thermal insulators keep cold in or out</li> <li>• thermal insulators warm things up</li> <li>• solids dissolved in liquids have vanished and so you cannot get them back</li> <li>• lit candles only melt, which is a reversible change.</li> </ul>		
<p><b>2)What are thermal conductors and insulators?</b></p> <p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class? What do you need to keep warm around you? What do you need to keep cool? Why? (appliances)</i></p> <p><b>Science Working scientifically Skills:</b></p>	<p><b>Science reasoning task: explorify:</b> <a href="#">Hot drinks for cold days - Explorify</a></p> <p><b>Activity 1:</b> PowerPoint – classify objects that keep heat in or out- pupils to use own criteria for classifying. Explain the terms insulators and conductors.</p> <p><b>Activity 2:</b> Thermal quiz- pupils to complete quiz as groups.</p> <p><b>Activity 3:</b> Plan keeping hot drink warm the longest – which material will be the best to be a thermal insulator? (Prediction/ method/ results)</p>	<p><b>Activity 1:</b> PowerPoint- Venn Diagram, objects to classify.</p> <p><b>Activity 2:</b> post it notes to complete quiz.</p> <p><b>Activity 3:</b> Complete differentiated planning template.</p>	<p><b>Assessment:</b> Are pupils able to predict, create method and record results?</p>

 <p><b>Science Enquiry Type</b></p> <p><b>Comparative/ fair testing</b></p> <p><i>Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.</i></p> <p><i>Mixtures can be separated by filtering, sieving and evaporation.</i></p> <p><i>Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.</i></p>	<p><b>Misconception:</b></p> <p>Some children may think:</p> <p>Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.</p> <p>Some children may think:</p> <ul style="list-style-type: none"> <li>• thermal insulators keep cold in or out</li> <li>• thermal insulators warm things up</li> <li>• solids dissolved in liquids have vanished and so you cannot get them back</li> <li>• lit candles only melt, which is a reversible change.</li> </ul>		
<p><b>3) Which is best material to clean up mess?</b></p> <p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class? Have you ever spilt something that you needed to clean up? Did it the material clean up the mess?</i></p>	<p><b>Science reasoning task: explorify:</b> <a href="#">Hot or cold - Explorify</a></p> <p><b>Activity 1:</b> PowerPoint go through previous learning about properties of materials. Share problem of which material is best to clean up mess.</p> <p><b>Activity 2:</b> Carry out experiment and record results. Create graph to show absorption.</p>	<p><b>Activity 1:</b> PowerPoint go through concept map.</p> <p><b>Activity 2:</b> plan experiment on planning template.</p> <p><b>Activity 3:</b> graph to present results.</p>	<p><b>Assessment:</b> Are pupils able to present their results in an appropriate graph?</p> <p><b>Homework:</b> research different materials and their uses.</p>


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<p><b>4)Which is best material for noise control?</b></p> <p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class? When might it be useful to block out sound?</i></p>	<p><b>Activity 1:</b> PowerPoint go through and discuss which material will be best for cancelling / muffling noise?</p> <p><b>Activity 2:</b> Show concept cartoons and plan experiment (prediction, method, results, evaluation)</p>	<p><b>Activity 1:</b> PowerPoint go through, and role play how night and day occur.</p> <p><b>Activity 2:</b> children to work in small groups to plan an experiment- post it note</p>	<p><b>Assessment:</b> Able to explain why and how night and day occurs.</p>


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<p><b>5) Which substances are soluble or insoluble?</b></p> <p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class? What happens to sugar when in water?</i></p>	<p><b>Science reasoning task: explorify:</b> <a href="#">Delicious Drinks - Explorify</a></p> <p><b>Activity 1:</b> PowerPoint what dissolving is.</p> <p><b>Activity 2:</b> which material is soluble and insoluble? Set up an experiment and carry it out.</p>	<p><b>Activity 1:</b> PowerPoint identify what dissolving is.</p> <p><b>Activity 2:</b> model templates / post it planning.</p>	<p><b>Assessment:</b> what is soluble and insoluble?</p> <p><b>Homework:</b> to describe what happens when you dissolve something?</p>


<p><b>Science Working scientifically Skills:</b></p>  <p><b>Science Enquiry Type</b></p> <p><b>Observation over time</b></p> <p><i>Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.</i></p> <p><i>Mixtures can be separated by filtering, sieving and evaporation.</i></p> <p><i>Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.</i></p>	<p><b>Activity 3:</b> conclude</p> <p><b>Misconception:</b></p> <p>Some children may think:</p> <p>Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.</p> <p>Some children may think:</p> <ul style="list-style-type: none"> <li>• thermal insulators keep cold in or out</li> <li>• thermal insulators warm things up</li> <li>• solids dissolved in liquids have vanished and so you cannot get them back</li> <li>• lit candles only melt, which is a reversible change.</li> </ul>	<p><b>Activity 3:</b> what did your results tell you?</p>	
<p><b>6) How can we separate mixtures of material?</b></p> <p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class? How would you separate different things? How do you organise your bedroom?</i></p>	<p><b>Science reasoning task: explorify:</b> <a href="#">Tiny grains - Explorify</a></p> <p><b>Activity 1:</b> PowerPoint go through and discuss the different methods of separation.</p> <p><b>Activity 2:</b> to have a range of mixed materials to then separate using the most appropriate method.</p>	<p><b>Activity 1:</b> PowerPoint go through and explain what the different methods for separating materials are.</p> <p><b>Activity 2:</b> range of mixed materials and recording table to record results.</p>	<p><b>Assessment:</b> Are pupils able to separate using the most appropriate methods?</p>

<p><b>Science Working scientifically Skills:</b></p>  <p><b>Science Enquiry Type</b></p> <p><b>Fair testing</b></p> <p><i>Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. Mixtures can be separated by filtering, sieving and evaporation.</i></p> <p><i>Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.</i></p>	<p><b>Activity 3:</b> write an explanation leaflet about the different materials.</p> <p><b>Misconception:</b></p> <p>Some children may think:</p> <p>Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.</p> <p>Some children may think:</p> <ul style="list-style-type: none"> <li>• thermal insulators keep cold in or out</li> <li>• thermal insulators warm things up</li> <li>• solids dissolved in liquids have vanished and so you cannot get them back</li> <li>• lit candles only melt, which is a reversible change.</li> </ul>	<p><b>Activity 3:</b> word bank, explanation text template for some.</p>	
<p><b>Can changes be irreversible?</b></p> <p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class? Have you baked a cake? Can you pull it apart to retrieve the raw ingredients?</i></p>	<p><b>Science reasoning task: explorify:</b> <a href="#">Watched water being drained from rice or pasta? - Explorify</a></p> <p><b>Activity 1:</b> PowerPoint to describe the difference between reversible and irreversible changes.</p> <p><b>Activity 2:</b> observe what happens when different substances are mixed.</p>	<p><b>Activity 1:</b> <a href="#">Chemical reactions in cooking food - KS2 Science - BBC Bitesize</a> PowerPoint</p> <p><b>Activity 2:</b> milk, bicarbonate soda, vinegar Closed activity explaining the changes.</p>	<p><b>Assessment:</b> Are pupils able to use working scientifically skills?</p>



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<p><b>What is oxidation?</b></p> <p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class?</i></p>	<p><b>Science reasoning task: explorify:</b> Show different rusting objects- what is the same? What is different?</p> <p><b>Activity 1:</b> PowerPoint explain what oxidation means</p>	<p><b>Activity 1:</b> PowerPoint</p>	<p><b>Assessment:</b> Are pupils able to conclude using previous knowledge about materials?</p>

<p><b>Science Working scientifically Skills:</b></p>  <p><b>Science Enquiry Type</b></p> <p><b>Comparative</b></p> <p><i>Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.</i></p> <p><i>Mixtures can be separated by filtering, sieving and evaporation.</i></p> <p><i>Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials, and these are not reversible.</i></p>	<p><b>Activity 2:</b> plan an experiment – which nails rust the most in which liquids?</p> <p><b>Activity 3:</b> Carry out experiment and write conclusion and evaluate.</p> <p><b>Misconception:</b> Some children may think: Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.</p> <p>Some children may think:</p> <ul style="list-style-type: none"> <li>• thermal insulators keep cold in or out</li> <li>• thermal insulators warm things up</li> <li>• solids dissolved in liquids have vanished and so you cannot get them back</li> <li>• lit candles only melt, which is a reversible change.</li> </ul>	<p><b>Activity 2:</b> planning sheet / post it notes/ different nails/ different liquids</p> <p><b>Activity 3:</b> Conclusion and evaluation templates.</p>	
<p><b>Which material is the best for different aspect of the music festival? (writing)</b></p>	<p><b>Activity 1:</b> PowerPoint – recap learning so far and to discuss which materials were suitable for which aspects of the music festival?</p>	<p><b>Activity 1:</b> PowerPoint</p>	<p><b>Assessment:</b> Are pupils able to draw on their learning and findings</p>

<p><b>SCIENCE CAPITAL:</b> <i>How does this lesson connect with children in my class? Which materials are suited for your things around the house?</i></p> <p><b>Science Working scientifically Skills:</b></p>  <p><b>Science Enquiry Type Research</b></p> <p><i>Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.</i></p> <p><i>Mixtures can be separated by filtering, sieving and evaporation.</i></p> <p><i>Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new</i></p>	<p><b>Activity 2:</b> plan a letter to music festival manager to explain which materials are best suited to which aspect of the festival.</p> <p><b>Activity 3:</b> Write a letter to the music festival manager.</p> <p><b>Misconception:</b> Some children may think: Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.</p> <p>Some children may think:</p> <ul style="list-style-type: none"> <li>• thermal insulators keep cold in or out</li> <li>• thermal insulators warm things up</li> <li>• solids dissolved in liquids have vanished and so you cannot get them back</li> <li>• lit candles only melt, which is a reversible change.</li> </ul>	<p><b>Activity 2:</b> planning template / year 5/6 words to include</p> <p><b>Activity 3:</b> Books to write in.</p>	<p>to be able to suggest the appropriate materials.</p>
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