

**National Curriculum Objectives:**

*(Statutory Requirements)*

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

**Experimental and investigative work focuses on:**

<b>Planning an investigation:</b>	<b>Obtaining and evaluating evidence:</b>
1. Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.	2. Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. 3. Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. 4. Using test results to make predictions to set up further comparative and fair tests. 5. Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. 6. Identifying scientific evidence that has been used to support or refute ideas or arguments.

**Key vocabulary:**

**Previously taught:** heating, cooling, freezing, melting, ice, steam, solid, liquid, gas, water, solidify, melt, evaporate, condense, temperature

**New:** material, property, magnetic, hard, transparent, flexible, permeable. Dilute, saturated, conductor, insulator, resistance,

Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
1	<p>To compare and group together everyday materials on the basis of their properties, including their hardness, transparency and response to magnets by sorting and classifying materials according to their properties.</p> <p>Assessment: a,d, 1</p>	<p>Ask the children to explain what materials are and discuss the differences between natural and synthetic materials.</p> <p>Give each table a feely bag and ask the children to feel the materials inside (without taking them out) and describe the materials inside. Record on sugar paper. (photograph for evidence within books).</p> <p>When all children have felt all the materials, reveal them and share the words the children have used to describe them.</p>	<p>Explain that the words used to describe materials are called a materials properties. Discuss the different property terms on the flipchart. Beyond/ secure: Create own definitions Close to/ Below: work with teacher to create shared write of definitions (print off for books).</p> <p>Ask the children why it is important to know the properties of a material.</p> <p>Ask the children to look at each of the items within the feely bag and to discuss why the material was chosen for each item e.g. coin made of metal because it is hard. Record in a table within their books.</p> <p><b>Testing Properties:</b> Tell the children that they will be testing the properties of several different materials. Explain that they will test each material for magnetism, hardness transparency, flexibility and permeability. They should follow the instructions for each test on their differentiated Testing Properties Activity Sheet and test each different material. The children should record their results on their differentiated Testing Properties Activity Sheet. Look for children who can find a material's properties and can sort and compare materials according to their properties. Close to / Below: Follow the full instructions for each test. Secure: Devise their own instructions for testing magnetism and transparency. Beyond: Devise their ow instructions for testing magnetism and transparency and think of a use for each material based on its properties.</p>	<p>I can describe a material's properties.</p> <p>I can explain the uses of different materials based on their properties.</p> <p>I can sort and compare materials according to their properties.</p>	<p>5 or 6 feely bags filled with different Materials. Containing a coin, a paper clip, a rock, , a wooden spoon, a piece of tracing paper, a safety mirror, a plastic ruler.</p> <p>Different materials for children to test Magnets Small metal nails Goggles Jars or beakers Elastic bands Empty trays Measuring jugs Water</p> <p>Differentiated testing worksheets</p>
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2	<p>To give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals,</p>	<p>Show the children the two groups of sorted materials. Ask them to discuss with a partner how they have been sorted. Reveal to the children that they have been sorted into thermal insulators and thermal conductors.</p> <p>Ask the children if they can explain the properties of thermal insulators and thermal conductors. Reveal the list of properties of both. Ask the children to complete the bbc quiz (link on flipchart).</p>	<p>Show the children the design a lunchbox flipchart pages and explain that they are going to be designing an investigation to test which material is the best thermal insulator for a new lunch box.</p> <p><b>Testing Materials:</b> Show the children the list of equipment on the flipchart and ask them to talk to their partner about how they could test the conductivity of different materials. Take</p>	<p>I can identify materials that are thermal conductors and insulators.</p> <p>I can explain what thermal conductors and insulators are.</p> <p>I can plan and carry out an investigation into thermal</p>	<p>Containers Thermometers Ice cubes Rulers Stopwatches Different materials</p>

	<p>wood and plastic by investigating thermal conductors and insulators. To compare and group together everyday materials on the basis of their thermal conductivity by investigating thermal conductors and insulators. Assessment: a, 1, 2, 3,4,5</p>		<p>ideas. Steer them towards using ice cubes in a container and wrapping material around that.</p> <p>Discuss the concept of variables with the children. Ensure their understanding. Ask the children to identify the variables for this investigation and whether they are independent, dependent or controlled.</p> <p>Using the post it note planner, ask the children in groups to begin to plan their investigation. Photograph these to stick in their books. (children will write their own conclusion – do not use the sheets for this).</p> <p>Children carry out investigation. <b>Look for children who are confident in planning and carrying out their investigation.</b></p> <p>Record results and complete a conclusion (possible writing genre – letter to lunch bag company), (use prompt questions on flipchart.) <b>Look for children who can explain their reasons for their choice of material.</b> Below/ Close to : complete conclusion with teacher- use first two questions on flipchart.</p>	<p><b>conductors and insulators.</b> <b>I can give reasons for the uses of thermal conductors and insulators.</b></p>	
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3	<p>To give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic by investigating the best electrical conductors. To compare and group together everyday materials on the</p>	<p>Recap electrical conductors and insulators from Y4 by watching this clip. <a href="http://www.bbc.co.uk/education/clips/zy2qxnbn">http://www.bbc.co.uk/education/clips/zy2qxnbn</a> Ask the children to write conductor on one side of a whiteboard and insulator on the other and to play a game to identify materials as conductors or insulators. Use the pictures of materials on the flipchart and ask the children to hold up the correct card for each one.</p> <p><b>Look for children who are successful in identifying the electrical conductors and insulators.</b></p>	<p>Look at the flipchart page and explain to the children that different conductors have different levels of resistance, and therefore some materials conduct electricity better than others. Present the problem to the children about floodlights explain that they will need to observe the brightness of the bulb. (If we have a light sensor by then use that). Explain that the children should present their recommendations for the best material to use to make the floodlights as bright as possible.</p> <p>Ask the children to work in groups to investigate the conductivity of different materials. They should set up a simple circuit with a battery and a bulb, and use different metals to complete the circuit. They can either observe the brightness of the bulb with each material, or measure the light levels using a data logging box with a light sensor. They should order the materials on the basis of their conductivity. Focus on method writing with a particular emphasis on variables. <b>Look for children who can explain that different materials have different levels of conductivity, and can investigate the best conductor for a</b></p>	<p><b>I can identify electrical conductors and insulators.</b> <b>I can explain that some materials are better conductors than others.</b> <b>I can carry out an investigation to find the best electrical conductor.</b></p>	<p>Batteries Bulbs Wires Connectors such as crocodile clips Different metals to test in the circuit - ideas include: copper coin, iron nail, steel spoon, silver jewellery, gold jewellery.</p>

	basis of their electrical conductivity by investigating the best electrical conductors.		purpose.		
4	To know that some materials will dissolve in liquid to form a solution by investigating dissolving. To compare and group together everyday materials on the basis of their solubility by investigating dissolving	<b>Disappearing Act:</b> Ask the children to discuss the ideas about dissolving in the <b>concept cartoon</b> . Reveal the answer and explain dissolving using the information on the flipchart.  <b>Dissolving or Melting?</b> Explain the difference between dissolving and melting. These processes are commonly confused by children. Address any misconceptions. <b>Soluble or Insoluble?</b> Ask the children to test whether different materials are soluble or insoluble in water by following the instructions on the flipchart. They should complete the table on their Soluble or Insoluble Activity Sheet with their findings.	<b>Investigating Dissolving:</b> Ask the children to discuss possible variables that may affect dissolving. Reveal the suggestions on the flipchart and ensure children understand each one. Ask the children to work in pairs to choose an independent variable and dependent variable to investigate. They should complete their differentiated Dissolving Investigation Activity Booklet to plan their investigations. <b>Look for children who can successfully identify the variable in their dissolving investigation.</b>  Use the Temperature Dissolving Investigation Activity Sheet to scaffold their investigation. <b>Find the Answer:</b> The children should carry out their investigations in pairs. They should record their results in a bar chart on the axes provided on their differentiated Dissolving Investigation Activity Booklet, and make a conclusion based on their results. <b>Look for children who can identify the factors that affect dissolving.</b>	<b>I can describe dissolving.</b> <b>I can explain the difference between melting and dissolving.</b> <b>I can identify materials which will dissolve in water.</b> <b>I can investigate factors which affect the speed of dissolving.</b>	Materials to dissolve: sand, chalk, flour, rice, instant coffee granules, sugar, salt, gravy. Differently shaped/sized beakers; Different types of water (sparkling, flavoured, still); Teaspoons; Stopwatches; Weighing scales; Thermometers ; Different temperatures of water (cold, room temperature and approximately 40°C , but not higher than 45°C).
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5	To use knowledge of solids, liquids	<b>Supermarket Chaos!</b> Use the flipchart to explain the context of the lesson: various goods from a supermarket have been mixed up and the children	<b>Separating Processes:</b> Ask the children to move around the classroom to read each of the Separating Mixtures Explanations Activity Sheet. They should place a tally	<b>I can identify different ways materials can be mixed together.</b>	Play sand Table salt Water

	<p>and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating by separating different mixtures. To demonstrate that dissolving, mixing and changes of state are reversible changes by separating different mixtures. To describe how to recover a substance from a solution by separating different mixtures.</p>	<p>need to separate them. <b>Mixed Materials:</b> Describe the four different mixtures using the flipchart.. Ask the children to talk to their partner about how the materials have been mixed and how they could separate them. They should use the descriptions of the different types of mixtures on the flipchart and match them to the images.</p>	<p>on the tally chart under each explanation to show which mixture that process would be best suited to. Explain the different processes and how they work with the different mixtures using the information on the flipchart.  <b>Separate the Mixtures:</b> Organise the children into 4 approximately even groups. Ask them to move around the classroom in their groups to try to separate each of the mixtures using the processes described. They should complete their Separating Mixtures Activity Sheet as they work round. An adult should lead the 'Evaporation' activity if you choose to boil the salt water solution for immediate effects, rather than leave it for several days for the water to evaporate. <i>Look for children who understand how to use the different processes to separate mixtures, and who can explain which process is suitable for each different mixture.</i></p>	<p><i>I can use sieving, filtering, evaporating and other processes to separate mixtures of materials. I know when to use which processes to separate mixtures.</i></p>	<p>Raisins, flour and rice Paper clips Either a pan and a heat source to boil the water, or containers and a safe place to leave them when filled with water; Magnets. Funnels, filter paper, sieve, bowls.</p>
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6	<p>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 by</p>	<p>Ask the children to watch this clip: <a href="http://www.bbc.co.uk/education/clips/z9wkjxs">http://www.bbc.co.uk/education/clips/z9wkjxs</a> to find out more about chemical changes. Explain the irreversible changes seen in the clip in more detail using the information on the flipchart. Ask the children to talk to their partner to identify the reactant and the product of the chemical change seen on the clip.</p>	<p>Ask the children to sort the pictures of materials changing on their differentiated Identifying Changes Activity Sheet by cutting and sticking them in the correct column. <i>Look for children who can identify reversible and irreversible changes.</i> Explain how the reversible changes can be reversed, and identify the reactant(s) and product(s) of the irreversible changes. Explain that the children should work in groups to carry out two irreversible chemical changes to make new materials. Following the instructions on the flipchart, the children should mix warm milk with vinegar, and then bicarbonate of soda with vinegar. As they complete each activity, explain the new materials they have made and their uses using the information on the flipchart The children should complete their Differentiated Irreversible Changes Activity Sheet to describe the irreversible changes and explain the new materials created. <i>Look for children who can</i></p>	<p><i>I can identify irreversible chemical changes. I can explain irreversible chemical changes. I can describe the new materials created in irreversible chemical changes.</i></p>	<p>Warm milk (approximately 40°C, and not hotter than 45°C)- store it in a vacuum flask for ease of use White (distilled) vinegar Mixing bowls or beakers Tablespoons Bicarbonate of soda Cardboard</p>

	identifying and observing irreversible chemical changes.		explain the irreversible changes and identify the useful new materials created.		Balloons Plastic bottles
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