

Pipworth Community Primary School Science Curriculum

Year Five Properties and Changes of Materials – Chemistry What different properties do materials have and how can you change them?

This six week unit provides you with a framework for progression, including learning objectives, suggested TAPS assessment and PLAN science resources, and clear links to national curriculum to help with topic planning.

Resources are available on TAPs assessment and PLAN science resources. You may want to look for more information on John Dunlop.

Useful Resources/Links

That's Chemistry!: A Resource for Primary School Teachers about Materials and their Properties (Edited by Jan Rees) Royal Society of Chemistry primary resources:

<https://edu.rsc.org/resources/grouping-andclassifying-materials/1791.article>

Further information

A database of everyday materials, man-made and natural, solid and liquid, and categorized according to other properties: <http://www.rsc.org/learn-chemistry/resource/res00001208/materials>

Another RSC resource, this one exploring reversible and irreversible changes (videos, tutorials, games and experiments): <http://www.rsc.org/learnchemistry/resource/listing?searchtext=%22Primary+collection%3A+reversible%2F+irreversible+change%22&eMediaType=MED00000009>

The Royal Society of Chemistry has a set of resources with topics in Biology, Chemistry and Physics that link to other parts of the curriculum: <http://www.rsc.org/learn-chemistry/resource/listing?searchtext=%22Primary+collection%3A+science+ideas+webs%22&eMediaType=MED00000009>

<https://kids.britannica.com/kids/article/reversible-and-irreversible-changes/632995>

Core Substantive Knowledge

A material is anything made from matter that can be shaped or manipulated in order to make something. A material is therefore anything that physically occupies space and has mass, which can be a solid, a liquid or a gas. At this stage, pupils should use the terms solid, liquid and gas when describing materials, although their understanding of the differences between these should be visual rather than linked to a particle model.

Substances can change in many ways. Some changes can be undone. In those cases, the material that was altered returns to its original state. This is called a reversible change. Other changes cannot be undone. The material is permanently altered. These are called irreversible changes.

Changing Shape

One of the simplest types of change is a change of shape. Some solids, such as clay, can be moulded into different forms and then moulded back into their original shapes. Such materials may be twisted, squashed, bent, or stretched.

Other solids cannot be easily moulded. Rock is very hard, so it cannot be bent or moulded by human efforts. However, very high temperatures and tremendous pressure can change the shape of rocks in certain circumstances.

Changing by Heating or Cooling

Heat is commonly used to change substances. Some of these changes can be reversed by cooling, but others are irreversible. This depends on the properties of the substance that is being heated and cooled.

Reversible Changes

When water is heated and cooled it goes through a series of reversible changes. Water in its solid state is called ice. When ice is heated, it melts and becomes liquid water. Further heating causes the liquid to change to a gas, called water vapour. When water vapour is cooled, it changes back to liquid water. Further cooling will cause the liquid water to freeze into ice.

Plastic is a material that can be made into almost any shape by heating it at a high temperature. Plastic goes through a reversible change when it is recycled. Its original shape—such as a water bottle or a food storage container—can be changed and made into something new. Recycled plastic can be turned into clothing, outdoor furniture, or playground equipment. The recycled plastic can also be turned back into another water bottle or container.

Irreversible Changes

When food is cooked it usually undergoes an irreversible change. When an egg is fried it is still an egg, but its texture, shape, smell, and appearance are altered. The heat has brought about an irreversible change.

Changing by Mixing

Mixing two or more substances together can cause them to change, and sometimes a new substance is produced as a result. Some of these changes are reversible while others are irreversible.

A reversible mixture is the addition of sugar to water. Sugar crystals dissolve, or break apart, when stirred into water. If this mixture is heated, the water evaporates, leaving the sugar crystals behind.

An irreversible mixture is cement powder and water. This combination results in a hard solid, and it cannot be reversed.

Chemical Changes

The ingredients of flour, butter, eggs, and sugar are used to make a cake. They change when they are mixed and baked. The heat causes a new substance—cake—to be made, and nothing can be done to change a cake back into its ingredients.

However, the changes in cake mixture are not just brought about by mixing or heat. Chemical changes also occur. Materials, such as egg and flour, are made up of chemicals that change to produce a new substance—in this instance, cake. It is an irreversible change.

Another chemical change is the mixture of vinegar and sodium bicarbonate. This combination creates a rapid chemical reaction. It fizzes and makes bubbles as a gas, carbon dioxide, is produced. This chemical change is irreversible because the mixture cannot be turned back into vinegar and sodium bicarbonate.

<p>Prior Knowledge Children have studied materials and their properties in earlier year groups, including transparency, magnetism and states of matter in Y3 and Y4.</p> <p>National Curriculum Links 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. 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 particular 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.</p> <p>Scientific Enquiry Concepts: Grouping and Classifying Seeking answers to problems through questioning Seeking answers to questions through collecting and presenting data</p> <p>Enquiry Skills: Asking questions Making Predictions Setting up Tests Observing and Measuring Recording Data Interpreting and Communicating data Evaluating</p>	<p>Sticky Knowledge: Different materials are used for particular jobs based on their properties.</p> <p>Magnetic materials are always made of metal, but not all metals are magnetic.</p> <p>A conductor is a material that heat can easily travel through. Most metals are thermal conductors (they conduct heat).</p> <p>An insulator is a material that does not let heat travel through them. Wood and plastic are both thermal insulators.</p> <p>A solution is made when solid particles are mixed with liquid particles. Materials that will dissolve are known as soluble. Materials that won't dissolve are known as insoluble. A suspension is when the particles don't dissolve.</p> <p>Reversible changes, such as mixing and dissolving solids and liquids together, can be reversed by: sieving, filtering and evaporating.</p> <p>Irreversible changes often result in a new product being made from the old materials (reactants).</p> <p>Vocabulary</p> <p>Material, property, magnetic, hard, transparent, flexible, permeable. Magnetic, non-magnetic Thermal, conductor, insulator, heat, material, variable Material, electric, conductor, insulator, resistance, circuit. Dissolve, soluble, insoluble, liquid, solid Separate, mixture, solution, suspension, evaporate, solid, liquid, filter, sieve, magnet, attract, particles Reversible, irreversible, reactant</p>		
Enquiry Question/Vocabulary	Activities	Resources	Success Criteria
<p>Revisit Prior Learning at beginning of enquiry</p> <p>This will require a full session.</p>	<p>What do you know about materials and their properties? Complete an online quiz with the children first to prompt their memories. https://wordwall.net/resource/6774669/materials-and-properties Ask children to create a mind map or poster with any information they can remember from previous units. This can take up a full session as hopefully the children will have a lot to remember. Complete another quiz https://www.educationquizzes.com/ks2/science/properties-of-materials/</p>		

KQ1 How many properties do materials have?

LO To compare and group together everyday materials on the basis of their properties, including their hardness, transparency and response to magnets

Sticky Knowledge

Different materials are used for particular jobs based on their properties.

Vocabulary

Material, property, magnetic, hard, transparent, flexible, permeable.



Scientific Enquiry Concepts:

- Grouping and Classifying
- Seeking answers to problems through questioning
- Seeking answers to questions through collecting and presenting data

Enquiry Skills:

- Asking questions
- Making Predictions
- Setting up Tests
- Observing and Measuring
- Recording Data
- Interpreting and Communicating data
- Evaluating

Introduce Knowledge Organiser

Explain what materials are, and discuss the difference between natural and synthetic materials. Point out the feely bags filled with different materials. Ask the children to feel the materials and try to identify them. While doing this, they should think of words to describe the materials. When all the children have felt all the materials, reveal the materials. Ask children to share the words they thought of to describe them.

Explain that the words used to describe a material are its properties. Ask the children to complete their **Material Properties Activity Sheet (SEND could cut and stick and HAP could write own definitions or write straight into their books)** by matching the properties with their definitions. Look for children who can describe properties of materials.

Magnetic	Attracts or attracts to magnets
Reflective	Will bounce off its surface
Absorbent	It will soak up liquid easily
Permeable	Will allow liquid and gases to pass through it
Translucent	Will let light, but not objects, pass through it
Flexible	Easy to bend
Hard	Will easily resist dent and burn quality
Flammable	Object is combustible
Insulating	Will not allow heat to transfer or heat flow
Transparent	Light passes through easily and objects are seen clearly

Discuss the importance of knowing a material's properties. Ask the children to look again at the items from the feely bags, and discuss in pairs why these materials were chosen for these items based on their properties.

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 (in folder)

Activity Sheet and test each different material. The children should record their results on their differentiated Testing Properties Activity Sheet (in folder or draw straight into their books). Look for children who can find a material's properties and can sort and compare materials according to their properties.

Record your results below.

Material	Properties				
	Magnetic Y or N	Hardness 1-5	Transparent Y or N	Flexibility 1-5	Permeable Y or N

- 5 or 6 feely bags filled with different materials, placed around the room.
- Suitable materials could include a copper coin, a steel paper clip, a rock, a slate, a wooden spoon, a piece of tracing paper, a safety mirror, a plastic ruler.
- Different materials for children to test (Ideas as above)
- Magnets
- Small metal nails
- Goggles
- Jars or beakers
- Elastic bands
- Empty trays
- Measuring jugs
- Water

I can describe a material's properties.

I can explain the uses of different materials based on their properties.

I can sort and compare materials according to their properties.

KQ2 Why is the material an object is made from useful?

LO To understand why objects are made from certain materials.

Sticky Knowledge

Different materials are used for particular jobs based on their properties.

Vocabulary

Material, property, magnetic, hard, transparent, flexible, permeable.

Scientific Enquiry Concepts:

Grouping and Classifying

Seeking answers to problems through questioning

Seeking answers to questions through collecting and presenting data

Enquiry Skills:

Asking questions

Making Predictions

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Observing and Measuring

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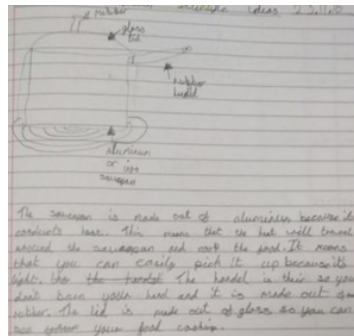
Retrieval

<https://quizizz.com/admin/quiz/5d6359b9e251b6001aa63da5/properties-of-materials>

Ask the children to share their ideas on the possible uses for the materials they tested, based on their properties. Ask for feedback on their ideas from the rest of the class. Why is it important that certain materials are used for particular jobs? For example, glass is used for windows because it is hard and transparent. Oven gloves are made from a thermal insulator to keep the heat from burning your hand.

Give children a variety of objects to explore and identify the materials they are made from. They should be able to say why they are made from these materials. They should consider things such as heat conduction, transparency, weight, magnetism etc.

For example: kettles, pans, plugs, fridge magnets etc. Children record their findings.



Range of objects made from specific materials
E.G. kettles, pans, plugs, fridge magnets etc.

I can say what material an object is made from.

I can explain why a certain material has been used for a particular object/job.

KQ3 Can you create a key to sort and group different materials?

LO Compare and group together everyday materials on the basis of their properties.

Sticky Knowledge

Different materials are used for particular jobs based on their properties.

Vocabulary

Material, property, magnetic, hard, transparent, flexible, permeable.



Scientific Enquiry Concepts:

Grouping and Classifying
Seeking answers to problems through questioning
Seeking answers to questions through collecting and presenting data

Enquiry Skills:

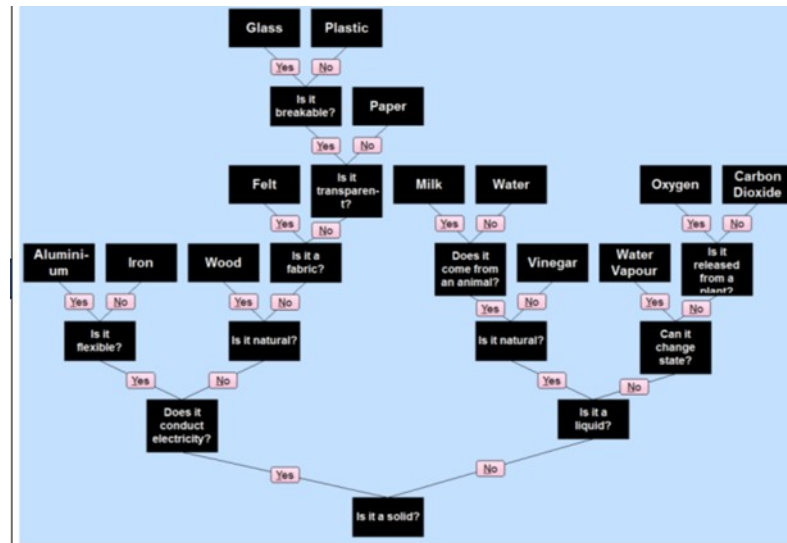
Asking questions
Interpreting and Communicating data

Retrieval

Can you explain why these objects are made from these materials?

- Wellingtons are made from rubber.
- Roofs are made from slates.
- Windows are made from glass.
- Pans are made from metal.
- Electrical wires are covered in plastic.

Give children a range of images showing different materials. Children should work in pairs or small groups to try and design a classification key to separate them. Ensure you have discussed the vocabulary with the children beforehand so they are familiar with the terms. Check for and address misconceptions as the children work.


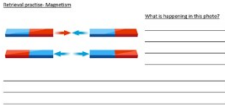


Images of different materials

Labels of materials for children to manipulate into a key rather than writing them down.

I can identify properties of different materials.

I can classify materials in different ways.

<p>KQ4 Are all metals magnetic?</p> <p>LO Investigate which metals are magnetic.</p> <p>Sticky Knowledge Magnetic materials are always made of metal, but not all metals are magnetic.</p> <p>Vocabulary Magnetic, non-magnetic</p>  <p>Scientific Enquiry Concepts: Grouping and Classifying Seeking answers to problems through questioning</p> <p>Enquiry Skills: Asking questions Making Predictions Setting up Tests Observing and Measuring Recording Data Interpreting and Communicating data Evaluating</p>	<p>Retrieval (from Y3)</p>  <p>https://www.bbc.co.uk/bitesize/articles/zw889qt</p> <p>Provide children with a variety of magnets and different metals to investigate. Make sure children are familiar about the names of the different metals. They could match name cards to the metals before starting the investigation. Do all these metals have the same properties? Discuss.</p> <p>Children should help to devise their own test for finding out if all metals are magnetic or not. Children carry out their investigation and record their results and conclusions.</p> <p>Children record their results in a result table and write a conclusion.</p>	<p>Magnets</p> <p>Collection of different metals</p>	<p>I can set up a test to see if all metals are magnetic.</p> <p>I can make observations.</p> <p>I can record my results.</p> <p>I can write a conclusion.</p>
<p>KQ5 How can we keep our lunch</p>	<p>Retrieval</p>	<p>Containers</p>	<p>I can identify materials</p>

cool?

LO Investigate the uses of thermal conductors and insulators.

Sticky Knowledge

A conductor is a material that heat can easily travel through. Most metals are thermal conductors (they conduct heat).

An insulator is a material that does not let heat travel through them. Wood and plastic are both thermal insulators.

Vocabulary

Thermal, conductor, insulator, heat, material, variable

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KQ6 How can we keep our tea

(Y4) Ensure pupils are familiar with the terms insulator/conductor that they should know. <https://www.bbc.co.uk/bitesize/clips/zvbb4wv>

Fill in the blanks: **insulator/conductor**

A _____ is a material that allows electricity to pass through it.

An _____ is a material that does not allow material to travel through it.

What kind of materials conduct electricity?

What kind of materials will not conduct electricity?

Tell the children they will be using some of their knowledge on insulators and conductors in this lesson.

Show the children the diagram of materials (below) or have actual objects in sorting hoops. Ask them to discuss how they have been sorted with a partner, before revealing that they have been sorted into thermal conductors and insulators.



Explain what thermal insulators and conductors are (see sticky knowledge).

Explain the context of the investigation: finding the best thermal insulator for a new lunch box. Show the children the list of equipment and ask them to talk to their partner about how they could test the conductivity of different materials. Share and take ideas. (see Flipchart). Children carry out the investigation.

Children record their findings:

Investigating Materials		Investigating Materials																																								
<p>Do you have been asked to help design the best material for the new lunch box? It's time to think about the different things you can use to make the lunch box.</p> <p>What material will you use?</p> <p>What material do you prefer and for the best reason? (In your own words)</p> <p>What are the independent variables of your investigation? (Tip: This is the thing you will change in the investigation)</p> <p>What are the dependent variables? (Tip: This is the thing that you observe or measure in your investigation)</p> <p>What are the controlled variables? (Tip: These are the things that you keep the same in the investigation)</p>		<p>Copy in your investigation and record your results in the table below.</p> <table border="1"> <thead> <tr> <th>Material</th> <th>Starting time / temperature of water</th> <th>Temperature of water after 10 minutes</th> <th>Temperature of water after 20 minutes</th> <th>Temperature of water after 30 minutes</th> <th>Temperature of water after 40 minutes</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>					Material	Starting time / temperature of water	Temperature of water after 10 minutes	Temperature of water after 20 minutes	Temperature of water after 30 minutes	Temperature of water after 40 minutes																														
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Retrieval

Thermometers

Ice cubes

Rulers

Stopwatches

Different materials

KQ5 Flipchart with investigation on.

Cups

that are thermal conductors and insulators.

I can explain what thermal conductors and insulators are.

I can plan and carry out an investigation into thermal conductors and insulators.

I can give reasons for the uses of thermal conductors and insulators.

I can set up a fair test.

warm?

LO Investigate the uses of thermal conductors and insulators.

Sticky Knowledge

A conductor is a material that heat can easily travel through. Most metals are both thermal conductors (they conduct heat).

An insulator is a material that does not let heat travel through them. Wood and plastic are both thermal insulators.

Vocabulary

Thermal, conductor, insulator, heat, material, variable



Scientific Enquiry Concepts:

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Enquiry Skills:

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Evaluating

KQ7 How can you make a bulb

QUIZ:

<https://www.educationquizzes.com/ks2/science/thermal-insulators-and-conductors/>

TAPS Assessment Insulation Layers

You will need to introduce new vocabulary before beginning.

Today we are going to be packaging technologists.

You want to see which cup will keep your tea warm for longer. Show different cups of hot water, e.g. paper cup, stacked paper cups, thermos mug. Measure the temperature of the water, repeat after about one hour (e.g. at the beginning and end of lunchtime).

Activity

Use the results of the pre-activity to make predictions about insulation (e.g. a good insulator has more layers / traps air / made of....). Provide a collection of different materials and invite the children to discuss their ideas about which might be good for keeping the drink warm. The children could order the materials according to which will be best insulators or select one to test for layering and record their predictions, giving reasoning based on the previous test results. Children plan and carry out an investigation to test their predictions.

Adapting the activity

Support: support the children with making choices about how to plan and carry out the test, e.g. by exaggerating 'unfairness', suggesting the use of a thermometer/probe, worksheet for structure.

Extension: Children to predict/choose which alternative material could insulate their beaker better, thinking about properties of the materials.

Other ideas: Which materials will insulate a hot baked potato / ice cube?



Time	1 layer	2 layers	3 layers	4 layers	5 layers	6 layers	7 layers
Start	31°	31°	31°	30°	29°	28°	28°
1 hr	29°	29°	28°	26°	25.5°	25°	25°
2 hr	27°	27°	26.5°	24°	23°	22.5°	22.5°

Questions to support discussion

- Where have you seen things insulated?
- What makes a good insulator? What other materials could be used as thermal insulators?
- What will you measure?
- How will you make it a fair test?
- Which material/layers do you predict will keep the water warmest for longest? Why?
- What evidence from the first test supports your prediction?

Children should be able to record their results and write a conclusion.

Retrieval

Warm water

Collection of different materials

Thermometers

I can make predictions.


I can use a thermometer to test the temperature.

I can record my results.

I can write a conclusion.

Batteries


I can identify electrical

<p>brighter?</p> <p>LO Investigate which electrical conductors make a bulb shine brightest.</p>  <p>Sticky Knowledge</p> <p>A conductor is a material that electricity can easily travel through. Most metals are electrical conductors (they conduct electricity).</p> <p>An insulator is a material that does not let electricity travel through them. Wood and plastic are both electrical insulators.</p> <p><u>Vocabulary</u> Material, electric, conductor, insulator, resistance, circuit.</p> <p>Scientific Enquiry Concepts: Seeking answers to problems through questioning Seeking answers to questions through collecting and presenting data</p> <p>Enquiry Skills: Asking questions Making Predictions Setting up Tests Observing and Measuring Recording Data</p>	<p>The children will have learnt about electrical conductors and insulators in Year 4.</p> <p>https://www.bbc.co.uk/bitesize/articles/zb6mt39 Complete the quiz on BBC Bitesize after retrieving the learning. Complete the True and False statements</p> <p>Use the Lesson Presentation to explain that different conductors have different levels of resistance, and therefore some materials conduct electricity better than others.</p> <p>Share the context of the investigation using the information on the Lesson Presentation. 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 (if possible AMRC may have some we could borrow). They should order the materials on the basis of their conductivity and plan their presentations using their differentiated Brighter Bulbs Activity Sheet (in folder).</p>	<p>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. Data loggers with light sensors if possible (if not children will have to make their own observations)</p> <p>Lesson Presentation (PowerPoint in folder)</p>	<p>conductors and insulators.</p> <p>I can explain that some materials are better conductors than others.</p> <p>I can carry out an investigation to find the best electrical conductor.</p>
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Interpreting and Communicating data
Evaluating

KQ8 Do all solids dissolve?

LO Investigate which materials will dissolve.



Freddie Fair
Investigates all the different substances and their properties.



Captain Classify
Learns to classify and categorise different substances.

Sticky Knowledge
A solution is made when solid particles are mixed with liquid particles.

Materials that will dissolve are known as soluble.

Materials that won't dissolve are known as insoluble.

A suspension is when the particles don't dissolve.

Vocabulary
Dissolve, soluble, insoluble, liquid, solid

Scientific Enquiry Concepts:
Seeking answers to questions through collecting and presenting data


Enquiry Skills:
Asking questions
Making Predictions
Setting up Tests

Retrieval
The children will have learnt about solids and liquids in Year 4.
Revise states of matter using:
<https://www.bbc.co.uk/bitesize/articles/zngfp4j#z4gff82>

Use lesson presentation in folder to discuss children's understanding of dissolving. Discuss the difference between dissolving and melting.

Introduce key vocabulary: soluble/insoluble using lesson presentation.

Ask the children to test whether different materials are soluble or insoluble in water by following the instructions on the Lesson Presentation. They should complete the table on their Soluble or Insoluble Activity Sheet 9(in folder) with their findings.
Children could record their findings as a bar chart.



Soluble or Insoluble - Does it Dissolve
Write the name of the substance in the box. Is it soluble or insoluble? Tick the box and write 'yes' or 'no'.

Material	Does it Dissolve?
sand	
chalk	
flour	
rice	
sugar	
salt	
gravy	

Write the name of the substance in the box. Is it soluble or insoluble? Tick the box and write 'yes' or 'no'.

Material	Does it Dissolve?


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).



I can describe dissolving.


I can explain the difference between melting and dissolving.


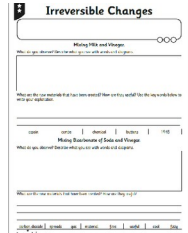
I can identify materials which will dissolve in water.

I can investigate factors which affect the speed of dissolving.

<p>Observing and Measuring Recording Data Interpreting and Communicating data Evaluating</p>			
<p>KQ9 How can we make the salt dissolve and reappear?</p>  <p>LO Investigate rates of dissolving and evaporation.</p> <p>Sticky Knowledge</p> <p>A solution is made when solid particles are mixed with liquid particles.</p> <p>Materials that will dissolve are known as soluble.</p> <p>Reversible changes, such as mixing and dissolving solids and liquids together, can be reversed by: sieving, filtering and evaporating.</p> <p><u>Vocabulary</u></p> <p>Dissolve, soluble, insoluble, liquid, solid</p> <p>Scientific Enquiry Concepts:</p>	<p>Retrieval Revise dissolving: https://www.youtube.com/watch?v=L9IMr5acGxw</p> <p>Fill in the blanks using your knowledge organiser: A _____ is made when solid particles are mixed with liquid particles. Materials that will dissolve are known as _____. Materials that won't dissolve are known as _____. A _____ is when the particles don't dissolve.</p> <p>TAPS ASSESSMENT LESSON</p> <p>Last session we looked at adding different materials to water to see what would happen. Today we are going to focus on salt dissolving and how we can increase the speed it takes to dissolve.</p> <p>Ask them to suggest ways of making the salt dissolve faster (e.g. stirring, temperature of the water, size of salt grains, volume of water). Ask them to choose a factor to investigate and to plan a fair test.</p> <p>Post it planners or planning boards could be used to focus on types of variable. Carry out tests and discuss outcomes.</p> <p>Adapting the activity Support: Within a scaffold/teacher support, make some suggestions about what could be kept the same/measured. Children explain how the planned test has been made fair. Extension: Plan a fair test independently, identifying and controlling relevant variables. Compare and improve plans with an emphasis on how taking an average of repeated readings makes the results more reliable. Other ideas: Consider how to test continuous variables e.g. temperature.</p> <p>Questions to support discussion</p> <ul style="list-style-type: none"> • What is your question? • How will you investigate this? • How will you keep your test fair? • What will you change? • What will you measure? • What will you keep the same? • Can you explain why you have made these decisions? <p>What do we now have? How can we prove this is a reversible change?</p> <p>How could we increase the time it takes for the reversible change to happen?</p> <p>Use a hairdryer if possible or leave on the radiator overnight.</p> <p>Talk about the surface area and ask if they think a larger wider plate or a thin tall glass would increase or decrease the time taken?</p>	<p>Salt Clear plastic cups Stirrers</p>	<p>I can gather data to answer a question.</p> <p>I can record my data in a table.</p> <p>I can explain what my data is telling me.</p>

<p>Seeking answers to questions through collecting and presenting data</p> <p>Enquiry Skills: Asking questions Making Predictions Setting up Tests Observing and Measuring Recording Data Interpreting and Communicating data Evaluating</p>	<p>Children make observations and record a conclusion. Provide key scientific vocabulary for them to use in their conclusion.</p> <p>How can we get the salt back again? Encourage children to think back to previous work on evaporation (Y4). Where could we leave the salt solution? Here could we leave it so the water evaporates quicker?</p>		
<p>KQ10 How can we separate different materials?</p> <p>LO: Use different processes to separate materials.</p> <p>Sticky knowledge: Reversible changes, such as mixing and dissolving solids and liquids together, can be reversed by: sieving, filtering and evaporating.</p> <p>Vocabulary Separate, mixture, solution, suspension, soluble, insoluble, dissolve, evaporate, solid, liquid, filter, sieve, magnet, attract, particles.</p> 	<p>Retrieval The children will have learnt about magnets in Year 3, and solids, liquids and evaporation in Year 4. They will have learnt about dissolving in this unit. Revise evaporation: https://www.bbc.co.uk/bitesize/articles/z9rwwnb#zssrr2p</p> <p>Why do we need to be able to separate materials from each other? Which industries needs to do this and why? (Recycling plants, land developers, mining, quarries etc.)</p> <p>Whole Class: Have all equipment prepped. On each set of desks have equipment covered over with a cloth (sieve, filters, magnets and a hairdryer or candle) and the following mixed objects in containers: flour, rice and pasta; filter coffee in water, iron and brass paper clips; salty water.</p> <p>Ask children to discuss in groups how they think they could separate them into their constituent parts (discuss possible techniques). Now unveil the equipment and see if children can link them. Ask children how the filters work (and how they are similar / different to the sieve). Get children to look closely at pieces of filter paper using magnifying glasses. The paper fibres have small spaces between them that allow the liquid to pass through but not the solid particles. Compare with a very fine sieve, cotton wool and/or a piece of muslin. Show children how to fold a filter paper to place in a funnel and model filtering using a mixture of sand and water (remind children that when couscous and water are left to stand the couscous settles to the bottom of the container - show them how you could also decant the water off). Demonstrate that dissolved substances pass through the filter (you may taste sugar water by dipping finger in but warn children to never taste a substance unless they are totally certain of what it is and have an adult's permission!). How do children suggest they recover the soluble materials in water using the hairdryer? Remind children of the work they did on evaporation in Year 4. If the water (solvent) is heated it will evaporate, leaving the solute behind. Demonstrate using a salt solution in a Petri dish & heat leave for a time on a radiator.</p>	<p>Sieves Filters Magnets Hairdryer/candles Water Salt Flour, rice and pasta Filter coffee Iron & brass paper clips Access to Internet</p> 	<p>I can identify different ways materials can be mixed together.</p> <p>I can use sieving, filtering, evaporating and other processes to separate mixtures of materials.</p> <p>I know when to use which processes to separate mixtures.</p>

<p>Scientific Enquiry Concepts: Seeking answers to questions through collecting and presenting data</p> <p>Enquiry Skills: Asking questions Making Predictions Setting up Tests Observing and Measuring Recording Data Interpreting and Communicating data Evaluating</p>	<p>Share the BBC video clip about separating mixtures. Explain that children will explore how to separate the mixtures on their desks before suggesting other reversible mixtures to include.</p> <p>https://www.youtube.com/watch?v=pDDWCfNuhj4</p> <p>https://www.bbc.co.uk/bitesize/topics/zity4wx/articles/zrgj2sg</p> <p>Children write a conclusion explaining what they have found out.</p>								
<p>KQ11 Which materials are the best to make into a filter?</p> <p>LO Plan and carry out an investigation</p> <p>Sticky Knowledge</p> <p>Reversible changes, such as mixing and dissolving solids and liquids together, can be reversed by: sieving, filtering and evaporating.</p> <p>Vocabulary Sieving, filtering, reversible</p>  <p>Scientific Enquiry Concepts: Seeking answers to problems through questioning Seeking answers to questions through</p>	<p>Retrieval Sieving, evaporating or filtering?</p> <table border="1" data-bbox="542 560 1473 746"> <tr> <td></td> <td>The solid particles will get caught in the filter paper but the liquid will be able to get through.</td> </tr> <tr> <td></td> <td>Smaller materials are able to fall through the holes in the sieve, separating them from larger particles.</td> </tr> <tr> <td></td> <td>The liquid changes into a gas, leaving the solid particles behind.</td> </tr> </table> <p>Muddy water filtration competition. Today you will be creating a filtration process to clean the dirty water. You will have time to plan what you will need, what your method will be and then to carry out the activity.</p> <p>Explain to the children that the mud and water have been mixed together but that this change can be ‘reversible.’ Explain what reversible means. This is a timed activity and we will be looking at the methods you have used that will clean your dirty water. At the end of the time each group will bring their water out to the front and we will give it a mark out of 10 for how clear it is.</p> <p>You must try to keep as much of the water as you can- if the water level drops too low you will have to start again as we will not have a sample to compare at the end.</p> <p>Children make observations and record results. They interpret their results to</p>		The solid particles will get caught in the filter paper but the liquid will be able to get through.		Smaller materials are able to fall through the holes in the sieve, separating them from larger particles.		The liquid changes into a gas, leaving the solid particles behind.	<p>Muddy water, sieves, rocks, pebbles, cotton wool, leaves, gravel, funnel, containers, filter paper, coffee filters, felt and paper towels, stop watches</p>	<p>I can plan and carry out an investigation.</p> <p>I can make observations and record my results.</p> <p>I can interpret my results.</p>
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<p>collecting and presenting data</p> <p>Enquiry Skills: Asking questions Making Predictions Setting up Tests Observing and Measuring Recording Data Interpreting and Communicating data Evaluating</p>	<p>answer the Key Question.</p>		
<p>KQ12 Are all changes reversible?</p> <p>LO Identify and explain irreversible chemical changes.</p> <p>Sticky Knowledge Irreversible changes often result in a new product being made from the old materials (reactants). For example, burning wood produces ash. Mixing vinegar and milk produces casein plastic.</p> <p>Vocabulary Irreversible, reactant</p> <p>Scientific Enquiry Concepts: Seeking answers to problems through questioning Seeking answers to questions through collecting and presenting data</p> <p>Enquiry Skills: Setting up Tests Observing and Measuring</p>	<p>Retrieval Reversible changes, such as mixing and dissolving solids and liquids together, can be reversed by: _____, _____ and _____.</p> <p>Ask the children if they have ever fried an egg or watched one being fried. What happens to the egg? How does it change? Explain about chemical changes. Explain the irreversible changes that happen to the egg. Ask the children to talk to their partner to identify the reactant and the product of the chemical change. Explain how the reversible changes can be reversed, and identify the reactant(s) and product(s) of the irreversible changes.</p> <p>Ask children to look at the pictures of different materials. They sort them into reversible and irreversible changes.</p>  <p>Explain that the children should work in groups to carry out two irreversible chemical changes to make new materials.</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 Balloons Plastic bottles.</p> 	<p>I can identify irreversible chemical changes.</p> <p>I can explain irreversible chemical changes.</p> <p>I can describe the new materials created in irreversible chemical changes.</p>

Evaluating	<ol style="list-style-type: none"> 1. The children should mix warm milk with vinegar. 2. Then bicarbonate of soda with vinegar. <p>As they complete each activity, explain the new materials they have made and their uses. The children should complete their Differentiated Irreversible Changes Activity Sheet to describe the irreversible changes and explain the new materials created. Look for children who can explain the irreversible changes and identify the useful new materials created.</p>		
End of unit assessment activity: What different properties do materials have and how can you change them?	<p>Children will produce a piece of writing as a Scientist in order to answer the overall enquiry question and be quality marked by the class teacher.</p> <p>Scaffolding: Revisit Knowledge organiser, look back in books at the work covered in this topic Clicker to be used for scaffolding Sentence stems used etc</p>		