

St Peter's CE Primary School

Science Materials Topic Overview

Unit Overview:

This topic fills the National Curriculum requirement to learn about materials. Pupils will compare and group materials together, according to whether they are solids, liquids or gases. They will 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). Pupils will identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. They will learn that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Pupils will learn that dissolving, mixing and changes of state are reversible changes. They will 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. Pupils will use their knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.

Working Scientifically

Throughout the year, pupils will continue to work scientifically in lower KS2 by:

- asking relevant questions and using different types of scientific enquiries to answer them.
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.
- Comparing, contrasting and sorting

• Show my results in a variety of ways including branching databases

In upper KS2 by:

- 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
- I can compare, contrast and sort

Key Questions:

• I can choose to show my results in a variety of ways including branching databases

<u>LKS2</u>	
1.	How can materials be grouped?
	(Compare and group materials together, according to whether they are solids, liquids or gases)
2.	What affect does changes of temperature have on a material?
	(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)
3.	What are the stages of the water cycle?
	(Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature).
<u>UKS2</u>	
1.	Why do some solutions dissolve?
	(Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution)
2.	What are reversible changes?
	(Demonstrate that dissolving, mixing and changes of state are reversible changes)
3.	When are changes irreversible?

- (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.)
- How can mixtures be separated? (Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.)

Objectives co	vered in this unit:
Science (see progression in expectations document)	 <u>LKS2:</u> 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. <u>Investigation Suggestions:</u> What affect does heat have on water? Can steam turn back to water? Does temperature affect the speed of evaporation?
	 Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution 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. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.
	 <u>Investigation Suggestions:</u> Which materials are soluble? Does salt dissolve faster in warmer water? How many teaspoons of sugar dissolve in (?) amount of water? Will sugar/salt eventually stop dissolving? Explain Can filtration be used to purify water?
Geography	n/a
Historv	n/a
Art	n/a
DT	Linked in with science by a DT project based on electrical circuits as a separate unit.



Materials Key Knowledge

LKS2							
How can (Compare and group materials together, according to whether they a							
materials be	solids, liquids or gases)						
grouped?	Pupils need to know that these are states of matter- solid, liquid, gases.						
	<u>https://www.bbc.co.uk/bitesize/topics/zkgg87h/articles/zsgwwxs</u>						
	Solids						
	The properties of solids include:						
	 Solids stay in one place and can be held 						
 Solids stay in one place and can be held. Solids keen their shape. They do not flow like liquids. 							
 Solids always take up the same amount of space. They do not space 							
• Solias always take up the same amount of space. They do not spread							
gases. Solids can be cut or shaped							
	 Even though they can be poured sugar salt and flour are all solids. Each 						
 Even mough mey can be poured, sugar, sail and mour are all solids. In narticle of salt for example keeps the same shape and volume 							
	Liauids						
The properties of liquids include:							
 Liquids can flow or be poured easily. They are not easy to hold. 							
	 Liquids change their shape depending on the container they are in. 						
	• Even when liquids change their shape, they always take up the same amount						
	of space. Their volume stays the same.						
	Gases						
	The properties of gases include:						
	Gases are often invisible.						
 Gases do not have a fixed shape. They spread out and change their 							
shape and volume to fill up whatever container they are in							
	• Gases can be squashed.						
What affact	(Observe that some meterials chance state when they are bested on cooled						
does changes	and measure or research the temperature at which this happens in degrees						
of	Celsius (°C))						
temperature							
have on a	Demonstrate with ice which is a solid- when is it a solid? What temperature?						
material?	What happens when it is heated?						
	At what temperature does it melt?						
	What happens if ice is put in warmer than room temperature?						
	Does is melt faster?						
	Measure this temperature in degrees Celsius.						
	(Whole class investigation/ demonstration)						



	11852					
Why do some	(Know that some materials will discolve in liquid to form a colution and					
solutions	(Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution)					
dissolve	describe now to recover a substance from a solution)					
013301767						
	Ningeluing					
	Dissolving					
	Some substances dissolve when you mix them with water.					
	when a substance aissoives , it might look like it has disappeared, but in fact it					
	Just mixed with the water to make a transparent (see-through) liquid called					
	a solution.					
	super with water the super dissolves to make a transport solution. Salt is soluble					
	in water too					
	Substances that do not dissolve in water are called insoluble substances . When you					
	mix sand or flour with water they do not dissolve					
	mix sand or flour with water, they do not dissolve.					
	When salt is mixed with water the salt dissolves because the covalent bonds of					
	water are stronger than the jonic bonds in the salt molecules Once this happens					
	the salt is dissolved resulting in a homogeneous solution					
	https://www.bbc.co.uk/bitesize/topics/zitv4wx/articles/zpbdpbk					
	Key points					
	 A solution is made when a solute dissolves into a solvent 					
	• If a substance can dissolve into a solvent, it is soluble. If it cannot dissolve,					
	it is described as insoluble.					
	 Heating, stirring and using fine powders are all ways to speed up dissolving. 					
	How to recover a substance from a solution:					
	Simple distillation is a method for separating the solvent from a solution. For					
	example, water can be separated from salt solution by simple distillation. This					
	method works because water has a much lower boiling point than salt. When the					
	solution is heated, the water evaporates leaving the salt.					
	This could also be a practical demonstration.					
	Veu ecule de en investigation					
	You could do an investigation.					
	Investigation Suggestions					
	• which materials are soluble?					
	• Does sait also ive taster in warmer water?					
	How many teaspoons of sugar dissolve in (?) amount of water?					
	• will sugary sall eventually stop alsolving? Explain					
	See next key guestion for more information on dissolving and forming a solution					
L						

What are reversible	(Demonstrate that dissolving, mixing and changes of state are reversible changes)			
changes?				
	Reversible changes			
	Reversible and irreversible reactions are different.			
	A reversible change is a change that can be undone or reversed.			
	If you can get back the substances you started the reaction with, that's a			
	reversible reaction. A reversible change might change how a material looks or feels,			
	but it doesn't create new materials. Examples of reversible reactions include			
	dissolving, evaporation, melting and freezing. Irreversible changes can't be undone,			
	however, a reversible change means that the original substance can be retrieved.			
	Solutions and Dissolving			
	What is a solution? A solution is a specific type of mixture where one substance is			
	dissolved into another. A solution is the same, or uniform, throughout which makes			
	it a homogeneous mixture.			
	A solution has centain characteristics: It is uniform on homogeneous, throughout			
	the mixture It is stable and deach't change over time or settle. The colute			
	nentialed and a small they cannot be concreted by filtering. The calute and caluent			
	molecular connet be distinguished by the network over Tt deer not restance been of			
	holecules cannot be distinguished by the haked eye. It does not scatter a beam of			
	light. One example of a solution is sall water which is a mixture of water and salt.			
	You cannot see the sait and the sait and water will stay a solution it left alone.			
	Parts of a Solution Solute - The solute is the substance that is being dissolved by			
	another substance. In the example above, the salt is the solute.			
Solvent - The solvent is the substance that dissolves the other substance				
	example above, the water is the solvent.			
	Dissolving			
	A solution is made when one substance called the solute "dissolves" into another			
	substance called the solvent. Dissolving is when the solute breaks up from a larger			
	crystal of molecules into much smaller groups or individual molecules. This break up			
	is caused by coming into contact with the solvent.			
	In the case of salt water, the water molecules break off salt molecules from the			
	larger crystal lattice. They do this by pulling away the ions and then surrounding the			
	salt molecules. Each salt molecule still exists. It is just now surrounded by water			
	molecules instead of fixed to a crystal of salt.			
	Solubility- Solubility is a measure of how much solute can be dissolved into a litre of			
	solvent. Think of the example of water and salt. If you keep pouring salt into water,			
	at some point the water isn't going to be able to dissolve the salt.			
	Saturated- When a solution reaches the point where it cannot dissolve any more			
	solute it is considered "saturated." If a saturated solution loses some solvent then			
	solid crystals of the solute will start to form. This is what happens when water			
	evaporates and salt crystals begin to form.			

	Concentration - The concentration of a solution is the proportion of the solute to solvent. If there is a lot of solute in a solution, then it is "concentrated". If there is a low amount of solute, then the solution is said to be "diluted." (Year 6)			
	Miscible and immiscible - When two liquids can be mixed to form a solution they are called "miscible." If two liquids cannot be mixed to form a solution they are called "immiscible." An example of miscible liquids is alcohol and water. An example of immiscible liquids is oil and water. Have you ever heard the saying "oil and water don't mix"? This is because they are immiscible. (Year 6)			
	Reversible Changes			
	Water frozen, then melted to be frozen again.			
	und water evaporated to steam (gas) and through condensation returning to water.			
	Chocolate melted then returning to a solid again.			
When are changes irreversible?	(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.)			
	Reversible and irreversible changes KS2			
	Irreversible changes can't be undone, however, a reversible change means that the			
	original substance can be retrieved. This means that the original substance may look			
	include: dissolving, evaporation, melting and freezing.			
	https://www.bbc.co.uk/bitesize/topics/zjty4wx/articles/zk9mt39			
	https://www.bbc.co.uk/bitesize/topics/zjty4wx/articles/zk9mt39 Irreversible changes A change is called irreversible if it cannot be changed back again. In an irreversible change, new materials are always formed. Sometimes these new materials are useful to us.			
	https://www.bbc.co.uk/bitesize/topics/zjty4wx/articles/zk9mt39 Irreversible changes A change is called irreversible if it cannot be changed back again. In an irreversible change, new materials are always formed. Sometimes these new materials are useful to us. Heating			
	 <u>https://www.bbc.co.uk/bitesize/topics/zjty4wx/articles/zk9mt39</u> Irreversible changes A change is called irreversible if it cannot be changed back again. In an irreversible change, new materials are always formed. Sometimes these new materials are useful to us. <u>Heating</u> Heating can cause an irreversible change. For example you heat a raw egg to cook it. The cooked egg cannot be changed back to a raw egg again. 			
	 https://www.bbc.co.uk/bitesize/topics/zjty4wx/articles/zk9mt39 Irreversible changes A change is called irreversible if it cannot be changed back again. In an irreversible change, new materials are always formed. Sometimes these new materials are useful to us. Heating Heating can cause an irreversible change. For example you heat a raw egg to cook it. The cooked egg cannot be changed back to a raw egg again. Thermal: lets heat pass through easily. Thermal insulator: Does not let heat pass through easily. 			
	https://www.bbc.co.uk/bitesize/topics/zjty4wx/articles/zk9mt39Irreversible changes A change is called irreversible if it cannot be changed back again. In an irreversible change, new materials are always formed. Sometimes these new materials are useful to us.Heating Heating can cause an irreversible change. For example you heat a raw egg to cook it. The cooked egg cannot be changed back to a raw egg again.Thermal: lets heat pass through easily. Thermal insulator: Does not let heat pass through easily.Mixing Mixing substances can cause an irreversible change. For example, when vinegar and bicarbonate of soda are mixed, the mixture changes and lots of bubbles of carbon dioxide are made. These bubbles and the liquid mixture left behind, cannot be turned back into vinegar and bicarbonate of soda again.			

How can	(Use knowledge of solids, liquids and gases to decide how mixtures might be				
mixtures be	e separated, including through filtering, sieving and evaporating.)				
separated?					
	Investigation Suggestion:				
	 Can filtration be used to purify water? 				
	Filtration used to clean water and separate dirt from water can be demonstrated to				
	the class and then recorded in STEM books.				
	Simple distillation is a method for separating the solvent from a solution. For example, water can be separated from salt solution by simple distillation. This method works because water has a much lower boiling point than salt. When the solution is heated, the water evaporates leaving the salt.				
	This could also be a practical demonstration.				
	This topic is a very practical topic. You can do a number of whole class demonstrations/ investigations but only one needs to be a full written				
	investigation with something to measure so that results can be recorded				
	and a graph plotted. You can choose one of any of the suggested				
	investigations as your full written one.				



Materials Vocabulary

Vocabulary				
Tier 1	Material	Compare	Temperature	Measure
(general)	Reversable	Irreversible	Formation	Filtering
	Sieving	Heat	Cooled	Degrees
	Property	Volume	Precipitation	Vapour
	Steam	Separate	Boiling	Mixing
Tier 2	Solids	Liquid	Gas	Evaporation
	Condensation	Dissolve	State	Cycle
	Thermometer			
Tier 3	Substance	Particle	Solubility	Saturated
	Solution	Soluble	Insoluble	Concentration
	Miscible	Immiscible	Solute	Distillation
	Molecule	Thermal	Insulator	