



Solids, liquids and how they can be separated

Topic Summary

During this topic pupils will learn about the differences between solids and liquids and recognise that the same material can exist as both solid and liquid. They will identify changes that occur when solids and liquids are mixed, and how to separate undissolved solids from a liquid. They will learn that melting and dissolving are different and recognise that when a solid dissolves it is still there.

Pupils will be asked to:

- decide what apparatus to use;
- make and record observations and measurements;
- draw conclusions.

Pupils will explain everyday observations about processes such as dissolving and filtering using scientific ideas.

5–14 Guidelines Attainment Targets

Level C

- describe changes when materials are mixed
- describe how solids of different sizes can be separated
- distinguish between materials that are soluble and insoluble in water
- describe in simple terms the changes that occur when water is heated or cooled

Resources for further work

Filter papers, clear plastic jar with a mixture of three small solids (e.g. rice, beans, sugar).



Glossary / Vocabulary

changing state	When a substance changes from one of the state of matter (solid, liquid or gas) into another.
cooling	The process of becoming cooler.
differences	The ways in which things are not alike.
dissolve	A solid combines completely with a liquid and forms a solution.
filter paper	Paper that contains very small holes.
freeze	To change a liquid into a solid by cooling it down.
liquid	One of the three states of matter. A liquid takes the shape of any container it is poured into, but its volume remains unchanged.
liquefy	To make or become liquid.
measuring cylinder	Scientific apparatus used for measuring the volume of a liquid in cm ³ .
melt	To change a material from a solid to a liquid by heating it up.
scientific process	A process that involves science.
sieve	A utensil used to separate small pieces of solid material from each other, or the action of separating small pieces of solid material from each other by passing them through a mesh of small holes.
shape	The appearance or form of something.
solid	One of the three states of matter. A solid is firm and stable in shape.
solidify	To make or become hard or solid.
volume	The amount of space that something takes up.
observation	A comment based on what you have seen.
react	A process that takes place when two substances are mixed together and a new substance is formed.
reversible process	A process which can be reversed so that whatever has been changed can be changed back into its original state.

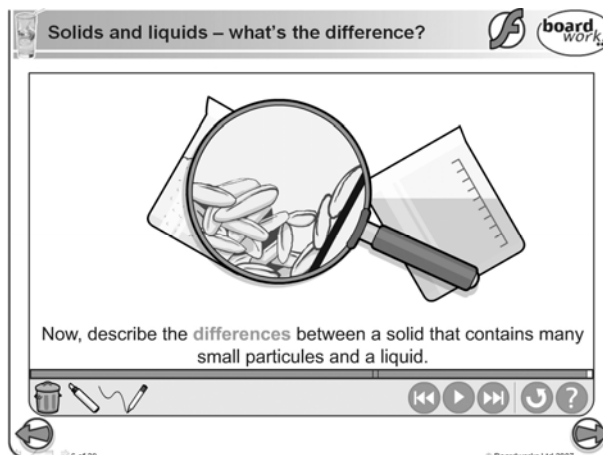


1. Solids and liquids – what's the difference?

Chapter Summary

Pupils will learn:

- to identify solids and liquids;
 - that there are liquids other than water;
 - to make careful observations and measurements of volume recording them in tables and using them to draw conclusions;
 - that liquids do not change in volume when they are poured into a different container;
 - that solids consisting of very small pieces behave like liquids in some ways.
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- Challenge pupils to identify other solids that we can pour (e.g. talcum powder). Ask: 'How do we know these things are solids?' (They can be piled up as well as poured).



Solids and liquids – what's the difference?

board works

Now, describe the differences between a solid that contains many small particules and a liquid.

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Notes



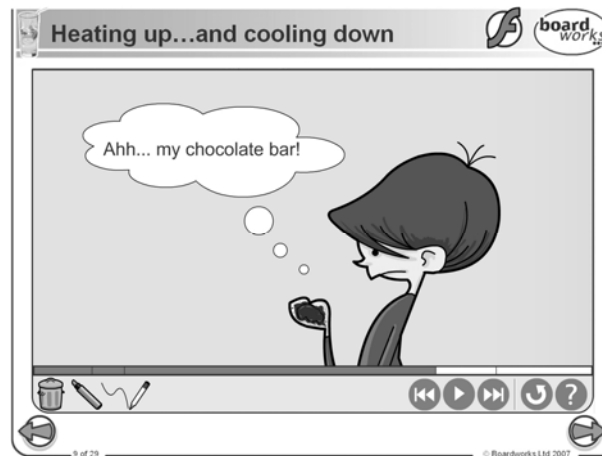
2. Heating up... and cooling down

Chapter Summary

Pupils will learn:

- that the same material can exist as both solid and liquid;
 - that liquids can be changed to a solid by cooling and this is freezing or solidifying;
 - that a solid can be changed to a liquid by heating and this is melting;
 - that different solids melt at different temperatures;
 - that melting and solidifying or freezing are changes that can be reversed and are the reverse of each other.
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- Ask pupils: "Why did the chocolate melt? How would you keep the chocolate bar from melting? Would the chocolate have melted if it was left by the bed instead?"
Relate this to temperature.

 - Ask the children why the steel is heated. Solid metal is melted (molten metal) by exposing it to intense heat. Once the solid metal has liquefied it is poured into a mould where it is left to cool and again solidify having taken the shape of the container. Explain to pupils that until the metal has completely cooled and solidified, it may be manipulated into other shapes or pressed into a flat sheet. Ask pupils to research and to find out more about the steel-making process.



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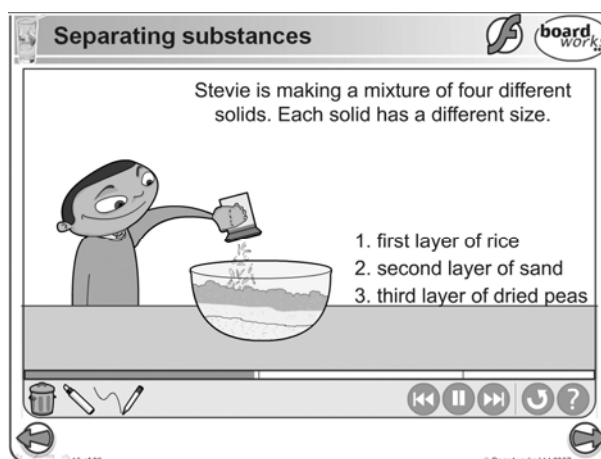


3. Separating substances

Chapter Summary

Pupils will learn:

- that solids can be mixed and that it is often possible to get the original materials back;
 - to choose appropriate apparatus for separating a mixture of solids;
 - that changes occur when some solids are added to water;
 - to make careful observations, recording results in tables and make comparisons;
 - that when solids do not dissolve or react with the water they can be separated by filtering;
 - to choose apparatus to separate an undissolved solid from a liquid;
 - that some solids dissolve in water to form solutions and that although the solid cannot be seen it is still present;
 - to predict whether salt or sugar can be separated from a solution by filtering and to test the prediction to see if it was correct;
 - to decide what apparatus to use;
 - when it is safe to taste things to test them.
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- Show pupils the jar of mixed solids. Ask: "Is there another way to separate a mixture like this?"
 - Pupils list other solids that do/do not dissolve in water (e.g. bath salts/gravel).
 - Explain that sieves will separate marbles from water but not sand or chalk as the holes in even the smallest sieve are too big. Discuss how filters are like sieves but with very small holes which the small pieces of sand and chalk cannot go through. Ask for suggestions of how to modify the apparatus to get sand back, suggestions could include paper towels, coffee filters, gauze bandage, blotting paper, fabrics, and muslin. Children may want to try out the apparatus and various materials. If so, ask them to describe and explain what they did.



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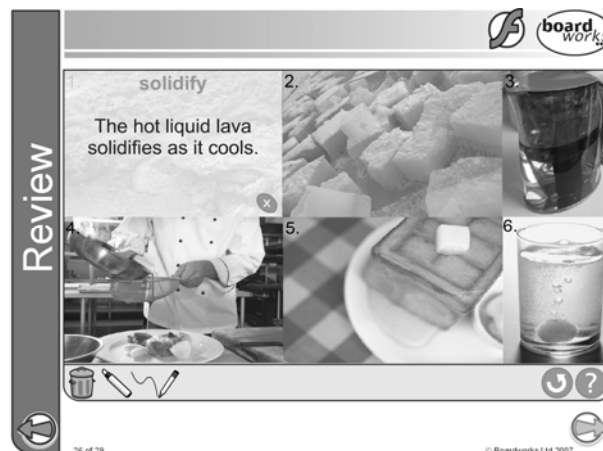


4. Review

- Ask pupils to examine filter papers closely, holding them up to the window to see the tiny holes.
- Ask pupils to think of examples of processes which occur everyday that relate to the vocabulary words in this unit, e.g. solidify, freeze, filter, sieve, melt and dissolve.

Extension task/homework

- Ask pupils to examine a range of plastic products to find the mark where the liquid plastic was injected into its mould before setting (usually a small circle, sometimes a pair of circles).



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