Year 6 Science
Unit 6C More about dissolving

ABOUT THE UNIT

This unit consolidates and extends children's understanding of what happens when a variety of solids dissolve.

Experimental and investigative work focuses on:

- making and testing predictions
- planning a fair test
- repeating observations and measurements and evaluating these
- representing data in line graphs and interpreting what these show.

Work in this unit also offers opportunities for relating understanding of dissolving to everyday contexts.

This unit takes approximately 12 hours.

WHERE THE UNIT FITS IN

Builds on Unit 4D 'Solids, liquids and how they can be separated' and Unit 5C 'Gases around us'

Children need:

- to know that some solids dissolve in water and others do not
- to know that undissolved solids can be separated from liquids by filtering.

Links with Units 5D and 6D.

VOCABULARY

In this unit children will have opportunities to use:

- words and phrases related to separating mixtures *eg dissolved, undissolved, solution, mixture, evaporate, condense, pure*
- words and phrases related to data handling *eg bar line graph, line graph, average, accurate*
- words which have different meanings in an everyday context *eg solution, pure*
- classificatory adjectives *eg clear, tap, sea*
- expressions for making and justifying predictions
- expressions for explaining, generalising and summarising.

RESOURCES

- filters and sieves for 'dirty' water containing an undissolved solid *eg gravel* and dissolved solid *eg salt*
- containers in which solutions can be evaporated in a warm place
- distilled water, 'sea' water, water coloured with blue ink
- apparatus for boiling salty water
- cold surface for condensing water
- thermometers
- apparatus for measuring volumes of water
- timers
- scoops for measuring amounts of solid
- samples of sugar and/or salt or other soluble solids of different grain size
- samples of an artificial sweetener

EXPECTATIONS

at the end of this unit

most children will:	recognise that solids remain in the solution when they dissolve and can be recovered by evaporation; identify several factors that affect the rate at which a solid dissolves; investigate an aspect of dissolving, presenting results obtained in a suitable graph and explaining what the results show
some children will not have made so much progress and will:	recognise that a solid can be recovered from a solution by evaporation; with help, investigate an aspect of dissolving and present results in a suitable table
some children will have progressed further and will also:	present results in a line graph where appropriate; explain why it is important to repeat measurements and how to deal with repeated results when drawing a graph

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
• that solids which do not dissolve in water can be separated by filtering which is similar to sieving • to describe a scientific process in a series of sequenced steps	1. Introduction – clear water from dirty water ♦ Set children a challenge to obtain some clear water from some dirty water *eg 'collected' from a puddle* which has clearly visible particles *eg gravel* in it and solids dissolved in it. Discuss their methods with the children and ask them to give a step-by-step description of what they did so that another class or group could follow it. Belair Lesson 1 uses sand, flour and water. Letts pp 70 – 73 Developing Science p 30 Activities 1 & 2 from Unit 6D fit here, and there is some overlap with activities in this unit.	• separate a solid from a liquid by sieving and/or filtering the mixture • sequence the steps required to separate a mixture *eg by producing a flow chart*	This activity revisits work in Unit 4D on separating a solid from a liquid. **SAFETY** – Do not let children drink water produced during this work. Ensure that the source of water used is unlikely to be contaminated with dog faeces.

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- to make predictions about which types of water contain dissolved materials and test these predictions
- that when solids dissolve a clear solution is formed (which may be coloured), the solid cannot be separated by filtering
- that when the liquid evaporates from a solution the solid is left behind

2. Predicting presence of dissolved solids in clear solutions.

♦ Present children with a number of clear liquids *eg tap water, sea water, the clear water from the first activity, coloured ink, distilled water* and ask them to predict for each liquid whether it is pure or whether it has material dissolved in it. Ask children to suggest how they could find out whether their predictions are true. If necessary, help them by suggesting they need to get rid of the water *eg by leaving small quantities of each liquid to evaporate in a warm place* to remind them about evaporation. Ask children to record what they did and what they observed and to relate this to their predictions. Talk with them about what the results show.

Belair Lesson 2 (differentiated recording sheets)
Developing Science p 30
Data Interpretation p 120 – 121 (differentiated questions)

- relate observations to their predictions saying whether the prediction was supported or not
- explain that when a solid dissolves it can't be seen but it remains in the solution *eg we couldn't see the salt any more but it was still there, the salt went into the solution*
- explain that when the water evaporates from a solution solids are left behind because they were dissolved in the solution but don't evaporate
- explain that nothing is left behind when distilled water evaporates because there was nothing dissolved in it

Blackboard chalks sometimes contain calcium sulphate which dissolves a little.

SAFETY – If children are to check by tasting that sugar or salt is still in the water, even if it cannot be seen, scrupulous hygiene must be observed. All containers and utensils must be clean. The sugar/salt must not be contaminated. The 'cold' surface must be completely clean.

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LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
• to make predictions about what happens when water from a solution evaporates and to test these predictions	**3. Evaporating water from solutions** ♦ Show children some boiling salty water, condense some steam on a cold surface and ask children to predict whether it will be salty or not. Test the prediction by tasting condensed water. Ask children to predict whether steam condensed from boiling blue ink will be blue or not. Ask children to suggest how to test this prediction and if possible demonstrate what happens. Belair Lesson 3 (differentiated recording sheets) Developing Science p 31 - 32	• explain that the steam from sea water will not be salty because only the water evaporates *eg when the water boils/evaporates the salt will be left behind* • predict that steam condensed from blue ink will not be blue and give a reason for their prediction *eg only the water evaporates*	At this stage it is not necessary to explain the term 'distilled'. However some teachers may wish to talk about this with some children in terms of evaporation and condensation. **SAFETY** – See note above about tasting. **SAFETY** – When boiling water keep children well back. Take care to avoid scalds when holding cold surface in the steam *eg by wearing oven gloves.*
• to turn ideas about helping solids dissolve more quickly into a form that can be investigated and decide how to carry out a fair test • to decide what apparatus to use and to make careful observations and measurements • to make comparisons and draw conclusions	**4. Speeding up dissolving** ♦ Ask children to think of everyday examples of dissolving solids in water *eg sugar in a cup of tea, salt in water for cooking* and to suggest ways in which they could make a solid dissolve faster. Ask them to suggest what might help a solid dissolve more quickly *eg stirring, size of the particles of solid, temperature of the water, volume of water.* Help children to decide which suggestions to investigate and how to carry out a fair test *eg try using the same amount of solids (mass or volume measure), the same number of stirs, the same volume of water and varying the temperature of the water.* Ask children to choose their own apparatus and to present their results in a table. Ensure a range of factors is investigated by different children. Ask groups of children to describe what they found out and to compare it with what others found. Belair Lesson 4 & 5 (differentiated recording) Developing Science pp 33 – 36 Letts p 76 – 77 Data Interpretation p 116 – 117, 124 - 125	• identify a range of factors which might affect how fast solids dissolve • use a fair test to investigate a question and explain how it was fair • describe one or two factors that help a solid dissolve more quickly	Children often confuse making something dissolve more quickly with making more solid dissolve. It is important to emphasise that this investigation is about making a solid dissolve more quickly. **SAFETY** – If children wish to use hot water it should be 'hand hot' only *eg from a tap* not boiling water from a kettle. **SAFETY** – Mercury thermometers are not suitable for use in primary schools because of the problem of clearing up toxic mercury if they are broken.

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
• to use a line graph to present results	♦ Using results from the previous activity, help children to present results as a line graph or bar chart. Practise graph drawing using data from other groups or data prepared for them and ask children to explain what the results show.	• present results, perhaps with some help, in a bar chart or line graph, explain what the results show *eg the salt dissolved faster when the water was hotter or the caster sugar dissolved faster than the granulated sugar; the smaller the grain size the faster it dissolved*	This work offers an opportunity to discuss whether a bar chart or a line graph is better for presenting results. For example, if temperature is the factor changed a line graph might be better because children could 'read off' what might happen at intermediate temperatures whereas if type of sugar is the factor changed a bar chart or bar line graph is appropriate as intermediate values have no meaning. This activity offers opportunities to use ICT to present graphs in a variety of ways.
• that several repeated measurements provide data that can be used with more confidence • to draw a line graph from results • to evaluate a graph in terms of how well it represents experimental results	**5. Reliability of data from experiments** ♦ Provide children with artificial sweeteners and tell them that the manufacturer needs to know how long they take to dissolve in chilled water, water at room temperature, warm and hot water. Collect results at particular temperatures. Using results at the same temperatures: – ask some children to calculate average time for sweetener to dissolve and plot on graph – ask others to plot all individual times at each temperature. Compare the plots using OHT overlays. Ask the children to comment on the graphs, prompting by asking questions *eg Are results at one temperature spread out or close together? Which set of results would you trust most?* Draw a line which doesn't represent the results well *eg through the highest points* and ask children to suggest a better line and explain why it is better. Agree a graph with the children and summarise why this fits the data well.	• explain why several measurements may provide data in which confidence can be placed • decide on a line for their graph that fits the data • explain why one line fits the data better than others	**SAFETY** – Hot water should be 'hand hot' only *eg from a tap* not boiling water from a kettle. This activity is designed to show children variation in results and it is therefore useful for each group of children to use the same sweetener and water at the same temperatures and to pool results for class discussion. Teachers could also ask children to consider and suggest reasons why the results vary.

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
	6. Review and assessment Draw together work in this unit by presenting children with a series of cards making predictions *eg I think when you evaporate sweetened tea the sugar will evaporate with the water; I think salt will dissolve more quickly in hot water than in cold water; I think that chalk will dissolve in water; I think it makes a difference whether you stir clockwise or anti-clockwise; I think bath salts dissolve more quickly when you stir the water.* Ask children to say whether the predictions are true or false and to suggest how they could test whether they are right or not. Select methods of listing predictions (or suggest others) and ask different groups to carry them out. Ask children to describe what they did and to suggest good points and bad points about others' methods, giving their reasons. + Belair Test 6C for school assessment records		Children may need guidance on how much solid to use in these investigations.