WATER & LIQUIDS

A collection of experiments investigating the properties of water and other liquids

Curriculum Links

Sc1 Testing ideas, planning & carrying out investigations, observing & measuring, making comparisons & fair tests

Sc3 Comparing everyday materials & their properties, evaporation and condensation in the water cycle, separating mixtures of materials

Summary of Experiments

General Format: Two whole class activities and three small group or demonstration activities.

- FILTERING & EVAPORATING ~ to separate solids & liquids
- THE CARBON TRAP ~ an investigation into cleaning water
- MARBLE RACE ~ to compare the viscosity of different liquids
- WATER ON THE MOVE ~ learn about capillary action
- CRYSTAL CREATIONS ~ grow some beautiful crystals

Health & Safety Considerations

SOME EXPERIMENTS REQUIRE LAB-COATS (OR SIMILAR E.G. PAINTING APRONS) & EYE-PROTECTION – SAFETY GLASSES OR GOGGLES

CLOSELY SUPERVISE CHILDREN WHEN USING CANDLES

! NO EATING OR DRINKING IN THE LABORATORY

! ALWAYS WASH YOUR HANDS AFTER DOING SCIENCE

Box Development by: *Liz Gorad, St George's Primary School*

FILTERING & EVAPORATING

Separate solids and liquids by filtering and evaporation (a whole class activity)

Learning Objective: *To discover the difference between soluble and insoluble solids*

Resources provided in Box *(* equipment also used in other experiments)*

(1 set of beakers, tripod, funnel, filter paper, watch glasses etc between 3 children)

- *10* Filter Funnels, plastic *
- *2 pks* Filter paper, circular *
- *10* 250ml Beakers, plastic *
- *10* 100ml Beakers, plastic *
- *10* Watch Glasses
- *10* Safety Mats
- *20* Tea Light candles
- *1 box* Matches (long)
- *10* Tripods
- *10* Stirring rods *

Resources you need to provide:

- Water
- Soluble & insoluble solids e.g. salt, sand, sugar, soil, chalk, baking soda

SAFETY

WEAR EYE PROTECTION – SAFETY GLASSES OR GOGGLES

TIE OR CLIP BACK LONG HAIR & FRINGES

ENSURE NO CLOTHING IS LOOSE

NO EATING OR DRINKING

WASH HANDS AT END

SUPERVISE PUPILS CLOSELY AT ALL TIMES WHEN USING CANDLES

Teachers should light Tea-Light Candles & ensure they are secure in holder
Children should not move Candles

! Pupils must stand up during heating activities
! Beware of hot salt spitting when evaporation is almost complete

In the unlikely event of a burn or scald:

Flood the whole affected area with cold water immediately!

(If you don't have a sink in the classroom fill a bucket with cold water before the activity)

Run cold water over the burn or scald for at least ten minutes, or until heat is no longer felt. The aim is to cool the area, and it may be uncomfortable, but persist. Call a first aider if there are any concerns.

FILTERING & EVAPORATING

Preparation:

- To make up a suitable sand-salt mix use approximately 20% salt by mass, allow about 3 or 4g per group of pupils
- Prepare any other solids & mixtures you plan to use

Introduction:

Introduce the idea of solutions and dissolving – where have they come across this before? (e.g. sugar in tea, bath salts in water)

Discuss what happens when something dissolves – how can you tell it's dissolved, can you get it back?

Pupils could come up with their own ideas for separating different mixtures, or follow the experimental method below.

Experiment Method:

Example - to separate a sand/salt mix

→ Pour a few grams (3/4g) of the sand-salt mix into the small (100ml) beaker
→ Add water until the beaker is about one-fifth full (about 20ml)
→ Stir the mixture gently for a few minutes.
→ Fold the filter paper so it fits in the funnel and sit the funnel on top of the larger (250ml) beaker.
→ Filter the mixture through the filter paper.
→ Put a watchglass on the tripod over a tealight candle <u>in a holder</u>
→ Carefully pour the filtrate (the solution you have filtered) into the watch glass.
→ <u>The teacher should light the tealight candle</u>
→ Heat the salt solution gently until it starts to "spit"

! **TAKE CARE**: Keep eye protection on, stand up and do not get too close.

→ Blow out the candle and let the damp salt dry in the dish

! **NB.** Only heat the Watch Glasses – not the Plastic Beakers!

! **In case of Broken Glass** – clear up immediately with dustpan & brush, wrap & dispose of safely. If any pupil cuts themselves, call a first-aider.

(Disposal: throw away salt, sand etc in the bin, flush away any solutions down a drain or sink with plenty of water)

Extension Activity:

→ Investigate 'saturated' solutions – how much of something do you have to add before no more will dissolve in a certain amount of water?

→ Small investigations e.g. Does stirring affect dissolving? Does a sugar lump dissolve quicker than grains of sugar? How could they test these questions…?

→ Does the temperature of the water affect how long something takes to dissolve?

→ Investigate how long evaporation takes in different environments e.g. sunny/shady, hot/cold.

→ Investigate dissolving in other liquids e.g. vinegar, oil

→ Compare the solubilities of different solids e.g. sugar (very soluble), salt (quite soluble), calcium sulphate-based chalk (not soluble) ** see link to CLEAPPS experiment below*

Discussion:

Why can sand and salt be separated using this experiment?

Why is the salt, sand and water mixture stirred?

Why is the salt solution heated?

The Science Stuff:

One important property of matter is called "solubility." We think about solubility when we dissolve something in water. If a chemical is soluble in water, then when you add it to water it will dissolve, or disappear (e.g. salt). If it is not soluble, then it will not dissolve and you will still see it floating around in the water (e.g. sand).

When you add a soluble chemical to dissolve in water you are making a "solution," and solutions are very important for chemistry. We call the chemical you are adding the "solute" and the liquid that it dissolves in the "solvent."

Even though after a solute dissolves in a solvent it becomes invisible, it is still there. If you were to evaporate all of the liquid away from the solution, you would be left with your dry chemical again.

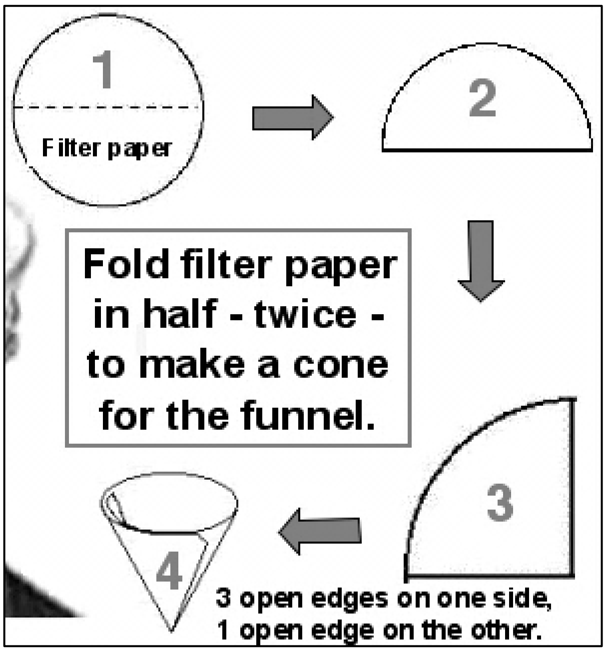
Whether something dissolves in something else or not depends on the structure of the substances. Some things dissolve easier in one kind of substance as opposed to another. Sugar dissolves easily in water and oil does not. Water has a low solubility when it comes to oil. Since oil is not soluble in water, it will never truly dissolve.

See www.chem4kids.com/files/matter_solution.html for a good explanation of solutions & dissolving.

Comments & Tips:

Instead of using candles to evaporate solutions, the watch glasses could be left in on a sunny windowsill

Folding Filter paper



{please add any useful tips about this experiment based on your experience}

Source:

Practical Chemistry 'Separating sand and salt'
www.nuffieldfoundation.org/practical-chemistry/separating-sand-and-salt
Science Buddies ' 'A Soluble Separation Solution'
www.sciencebuddies.org/science-fair-projects/project_ideas/Chem_p016.shtml
CLEAPSS Primary Newsletter 'Dissolving' activity
www.cleapss.org.uk/attachments/article/0/PST08.pdf?Primary/Resources/PST%20Newsletters/#search="salt"

THE CARBON TRAP

Filter dirty looking & smelly water to make it cleaner (a whole class activity)

Learning Objective: *To plan & carry out an investigation*

Resources provided in Box *(* equipment also used in other experiments)*

(1 set of beakers, funnels, filter paper etc between 3 children)

- *500g* Activated Charcoal
- *1 litre* Malt Vinegar
- *50ml* Washable Fountain Pen Ink or Food Colouring

- *10* Filter Funnels, plastic *
- *2 pks* Filter paper, circular *
- *10* 250ml Beakers, plastic *
- *10* 100ml Beakers, plastic *
- *1* Plastic pipette (3ml)
- *10* Weighing boats
- *10* Stirring rods *
- *10* Plastic teaspoons

Resources you need to provide:

- *Optional* – juice from sauerkraut or pickles, cooking oil
- *Optional* – cotton wool or other absorbent materials (e.g. paper towel, cheesecloth, sand etc)

SAFETY

WEAR EYE PROTECTION – SAFETY GLASSES OR GOGGLES

WEAR LAB-COATS OR SIMILAR (E.G. PAINTING APRONS)

NO EATING OR DRINKING

WASH HANDS AT END

<u>Activated charcoal powder</u> is low hazard:

BUT it is extremely messy and difficult to remove from clothing!

Fine powder is a fire hazard – keep away from naked flames

Do not inhale dust if spilt – sweep up slowly as much as possible, so as not raise airborne particles and wash the area.

– in case of skin contact, wash well with soap & water
– in case of eye contact, rinse gently with clean water
– if swallowed, rinse out mouth & seek first aid

THE CARBON TRAP

Preparation:

- Make up 'dirty water' solutions in 100ml beakers – e.g. with 1 drop of ink/food colouring per 100ml water, 50ml vinegar mixed with 50ml water. Coloured and smelly water could be combined, or left as separate solutions.

Introduction:

Discuss the importance of clean water – why do we need it for drinking, washing etc? What can happen if we drink dirty water?

Discuss the idea of contamination and impurities in water – where do they come from, how can we tell they are there? (e.g. colour, smell of water)

Think about how we can remove impurities from water?

Experiment Method:

Pupils could plan their own investigation using the materials provided, but demonstrate how to use the funnels and filter paper first.

→ Fold the filter paper so it fits in the funnel and sit the funnel on top of the larger (250ml) beaker

→ Choose a 'dirty water' solution (in the small beakers) and carefully pour about half of it (50ml) into the filter funnel

→ Note whether the drops of liquid filtering through have lost any of their original colour or smell.

→ Using a fresh piece of filter paper, place about five teaspoons (5g) of activated charcoal in the filter paper and repeat with the other half of solution.

→ Is there any difference between using the filter paper on its own and using the activated charcoal?

! Supervise the distribution & use of the Activated Charcoal (use weighing boats to transfer it)

(Disposal: throw away used charcoal, filter papers etc in the bin, flush away any solutions down a drain or sink with plenty of water)

THE CARBON TRAP

Extension Activity:

→ Experiment with how many times the activated charcoal can be used for filtering before it loses its ability to remove impurities

→ Try filtering juice from sauerkraut or pickles or water with cooking oil in

→ Use other absorbent materials for filtering (e.g. cotton wool, paper towel, cheesecloth, sand etc)

Discussion:

Describe the solutions and filters before and after filtration.

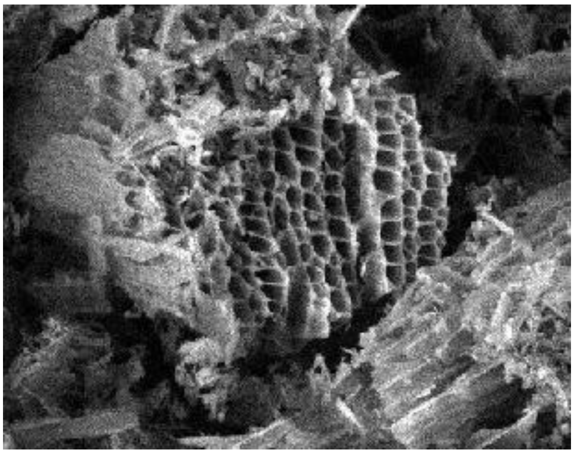
(NB. The vinegar still smells after filtration, but noticeably less so.)

Discuss how they planned and carried out the investigation, why did they choose their particular methods? Which is the best?

The Science Stuff:

The activated charcoal particles have many small holes in them and are very *porous*. This feature gives them a large surface area which allows the particles to attract and trap a large number of contaminant molecules.

Just 1 gram of activated charcoal can have a surface area in excess of 500m^2, so 5 grams have a surface area about half the size of a football pitch!



A very high resolution microscope image of activated charcoal

(source: http://en.wikipedia.org/wiki/File:Activated-carbon.jpg)

Drinking water is filtered through activated charcoal to remove impurities that would otherwise discolour and give it a bad taste.

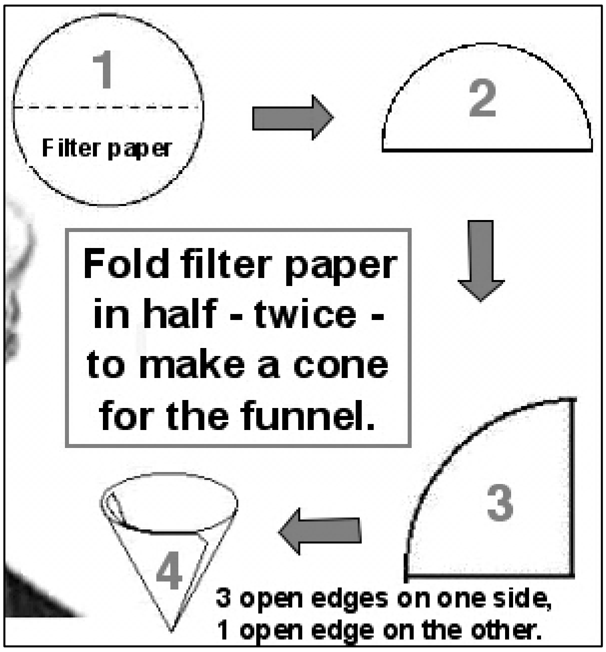
Heating wood to a very high temperature in the absence of air makes charcoal. When it is heated to an even higher temperature (about 930°C) impurities are driven from its surface and it becomes very porous, making activated charcoal.

THE CARBON TRAP

Comments & Tips:

This activity could lead on to a discussion or project about water conservation. One way to conserve water is to clean it and reuse it, but is this the only way? How much water do you use every day and how does this compare to people in other countries?

Folding Filter paper



{please add any useful tips about this experiment based on your experience}

Source: *RSC Classic Chemistry Experiments 'Chemical filtration'*
www.rsc.org/learn-chemistry/content/filerepository/CMP/00/000/482/cce-28.pdf
Practical Chemistry 'Decolourising and deodorising'
www.nuffieldfoundation.org/practical-chemistry/decolourising-and-deodorising

MARBLE RACE

Investigate the viscosity of different liquids by dropping marbles down very tall tubes (a demonstration or small group experiment)

Learning Objective: *To test and compare the properties of liquids*

Resources provided in Box *(* equipment also used in other experiments)*

- *5* Acrylic Tubes
- *10* Bungs (to fit tubes)
- *10* Marbles
- *1* Plastic Jug, 1L
- *1* Funnel *
- *5* Stopwatches
- *500g* Salt
- *500g* Sugar
- *500ml* Vegetable Oil
- *500ml* Baby Oil
- *5* Plastic Screw-top Bottles for solutions (500ml)

Resources you need to provide:

- Water (1500ml)
- *Optional* – other liquids e.g. bubble bath, shampoo, washing-up liquid, other cooking oils

SAFETY

NO EATING OR DRINKING

WASH HANDS AT END

Preparation:

- Make up solutions – add salt / sugar to 500ml water until no more dissolves
- Use the jug & funnel to pour solutions into tubes – **ensure bungs are secured tightly!** (Sellotape if necessary)

MARBLE RACE

Introduction:

Think about the properties of some different liquids e.g. water, cream, treacle, oil, washing-up liquid etc… Are they runny or thick, free-flowing or gloopy, smooth or sticky, fast or slow pouring?

The viscosity of a liquid is another term for the thickness of a liquid. Thick treacle-like liquids are viscous, runny liquids like water are less viscous.

How could we test the viscosity (thickness / runniness) of a liquid?

Which of the liquids which we are going to test do you think will be most viscous?

Experiment Method:

Suggested liquids to test: water, salt water, sugar solution, baby oil, vegetable oil

→ One person should hold each tube and another drops a marble in the top

→ Time how long it takes for the marble to reach the bottom

→ OR measure how far the marble travels in a certain time

*** Please empty the tubes and wash them out before you put them away ***

Extension Activity:

→ Instead of using marbles, leave a small air gap at the top of the tube & seal both ends very tightly. Quickly invert the tube and measure the time it takes for the air bubble to reach the top

→ Compare other liquids e.g. bubble bath, shampoo, washing-up liquid, different cooking oils

→ Look at the difference in density between the different liquids by seeing which small objects float & sink in them. You should see a big difference between the salt water and fresh water (but there is not much difference in viscosity)

Discussion:

Which liquid was the most viscous?

Why do you think that was?

Are ways we could improve this experiment or make our measurements more accurate?

Are there any other ways we could measure viscosity?

MARBLE RACE

The Science Stuff:

Viscosity is a measure of the resistance of a fluid when a force is applied. For example, pushing a spoon with a small force moves it easily through a bowl of water, but the same force moves mashed potatoes very slowly.

Viscosity is a very important quality of liquids that scientists frequently try to measure and change. It is difficult, for example, to transport highly viscous crude oil through offshore pipelines, so engineers use a variety of methods to try and lower the oil's resistance to flow through the pipelines.

Viscosity & Density are two different properties of liquids and shouldn't be confused! Viscosity is how easily something flows. Density is how much matter is packed into a space.

In other words, Density is a measure of how heavy & how closely packed the molecules in a substance are (its mass per volume); Viscosity is a measure of the strength of the forces between those molecules (its internal 'friction').

You can have dense liquids which are not very viscous (e.g. mercury) and light liquids which are very viscous (e.g. whipped cream).

Both density and viscosity decrease with temperature, but while density varies slightly, viscosity changes rapidly.

Ketchup is an interesting example – sometimes it flows easily and sometimes it doesn't! It is a 'non-newtonian' fluid, its viscosity depends on the force applied – the bigger the force, the less viscous it becomes (as you will know if you've ever splattered red sauce all over yourself trying to get it out of the bottle)

Volcanologists (people who study volcanoes) have a big interest in viscosity. The viscosity of molten rock or magma determines how easily a volcano will erupt, and what shape the lava flows and resulting mountains will take on.

A very thin and fluid magma erupts more easily and forms gentle mountain slopes, while a very thick magma erupts explosively and forms a fat lava flow and steep mountain slopes.

So, if you see a mountain formed from a volcano, you can estimate the viscosity of the magma that formed it just by looking at the angle of its slope!

(source: BBC Volcano Live www.bbc.co.uk/programmes/p00tmrjn)

MARBLE RACE

Comments & Tips:

The viscosity of some liquids can vary with temperature, this could be tested using warm water or by placing solutions in a fridge beforehand / leaving them in a warm place

{please add any useful tips about this experiment based on your experience}

Source: *Science Buddies 'Race Your Marbles'*
www.sciencebuddies.org/science-fair-projects/project_ideas/Chem_p055.shtml
RSC Classic Chemistry Experiments 'Viscosity'
www.rsc.org/learn-chemistry/resource/res00000387/classic-chemistry-experiments-viscosity

WATER ON THE MOVE

Explore the 'capillary' action of water ~ how it moves through different materials (a demonstration or small group experiment)

Learning Objective: *To observe and test*

Resources provided in Box *(* equipment also used in other experiments)*

- *6* Small plastic bowls
- *1 of each* Food colouring – 4 different colours
- *4* Plastic pipettes (3ml)
- *1 ball* String (thick, white)
- *2 rolls* Paper towel
- *1* 500ml plastic beaker
- *2* 250ml plastic beakers *

Resources you need to provide:

- Celery
- White Carnation(s)

SAFETY

NO EATING OR DRINKING
WASH HANDS AT END
WEAR LAB-COATS OR SIMILAR (E.G. PAINTING APRONS)

Preparation:

- Cut string into suitable sized pieces
- Cut the stem of the carnation(s) carefully in half with a sharp pair of scissors (you may want to set this experiment up beforehand, as it can be quite slow)

WATER ON THE MOVE

Introduction:

Think about how water moves on different surfaces and through different materials, e.g. what happens when you spill a drink?

Plants need to get water from the ground up into their leaves – how do you think they do this?

Experiment Method:

Paper Wick Experiment

- → Fill a beaker with water and put an empty bowl next to it.
- → Twist a paper towel round and round tightly to form a long wick.
- → Set one end of the towel in the water and the other end in the empty bowl.
- → The water should travel up the towel wick and then drip into the bowl.

String Experiment

- → Fill 4 plastic bowls with water and add a different colour of food colouring to each bowl (a few drops is enough).
- → Take a long piece of string and dip the end of it into one of the bowls.
- → Drape the string over the edge of that bowl and over the edge of the next bowl so that it dips slightly into the water in that bowl.
- → Continue until the string touches the water in each bowl.
- → Watch the coloured water creep along the string out of the bowls.

Celery Experiment

- → Half-fill the 500ml plastic beaker with water and add a few drops of food colouring.
- → Stand a stalk of celery in it.
- → You should see the celery change colour as the water travels up the stalk.

Carnation Experiment

- → Half-fill the two 250ml plastic beakers with water and add a few drops of different food colouring to each.
- → Sit the 2 parts of the carnation stem in the 2 beakers.
- → You should see the coloured water travel up the 2 halves of the carnation stem and mix at the top in the flower.

Extension Activity:

- → How far along a paper wick will water travel?
- → Will water travel uphill or even vertically through a paper wick?
- → Experiment with using other materials as wicks. Which does the water travel along best? How could you test this fairly?
- → Experiment with using other liquids and the paper towel wick. Do they travel further or less / quicker or slower than water?
- → Experiment with other flowers or plants and coloured water. Will it travel into their petals or leaves too?

Discussion:

What did you see and observe?

How much water went from the beaker to the bowl with the paper wick?

How long did it take?

Why do you think the water can travel upwards, against gravity?

The Science Stuff:

Capillary action is the ability of a liquid to flow in a narrow space (a *capillary*), without assistance from gravity or any other external forces.

Capillary action occurs because water is 'sticky' ~ water molecules stick to each other (surface tension) and to other materials, such as glass, paper and soil.

Dip a very thin glass tube into water and the water will rise up inside it. This is because the water molecules are attracted to the glass sides, so the liquid is pulled upwards at the edges. Water is also strongly attracted to itself, so the instead of just the edges of the water moving upward, the whole liquid surface is dragged upward. In fact, it will keep going up the tube until the pull of gravity is too much for it to overcome.

* See: www.education.com/science-fair/article/find-absorbent-brand-paper-towels/ for a good, simple explanation & diagram.

In this experiment the water flows through the tiny gaps between the fibres in the paper towel/string.

Capillary action is important for moving water (and all of the things that are dissolved in it) around. For example, plants and trees couldn't survive without capillary action. Plants put down porous roots into the soil and water gets inside them and starts moving up the plant tissue.

WATER ON THE MOVE

Comments & Tips:

This could lead onto an investigation into the 'surface tension' of water.

It also links to geology topics such as weathering (through capillary action water is draw into narrow cracks in rock – when it freezes it expands & breaks the rocks apart).

{please add any useful tips about this experiment based on your experience}

Source: *TLC Science Experiments for Kids 'Water on the Move'*
http://tlc.howstuffworks.com/family/science-experiments-for-kids6.htm
Education.com 'Absorbency of Different Kinds of Paper Towels'
www.education.com/science-fair/article/find-absorbent-brand-paper-towels/

CRYSTAL CREATIONS

Grow beautiful crystals from different salt solutions (a small group experiment)

Learning Objective: *To test and compare*

Resources provided in Box *(* equipment also used in other experiments)*

- 250g Salt (sodium chloride)
- 250g Epsom Salts (magnesium sulphate)
- 250g Alum (aluminium potassium sulphate)
- 250g Bicarbonate of Soda (sodium bicarbonate)
- 250g Cream of Tartar (potassium hydrogen tartrate)

- 10 250ml Beakers, plastic *
- 5 Stirring rods, plastic, short *
- 1 Thermometer
- 5 Weighing Boats *
- 5 Plastic teaspoons *

Resources you need to provide:

- Kettle (or source of hot water)
- Clear plastic cups or shallow plastic containers (1 per child/group)
- Pipe Cleaners (1 per child/group)
- Cotton Thread (1 reel)
- Pencils (1 per child/group)

SAFETY

WEAR EYE PROTECTION – SAFETY GLASSES OR GOGGLES
NO EATING OR DRINKING
WASH HANDS AT END

Salts are all LOW HAZARD – but Salt Solution will sting cuts & Epsom Salts are a laxative. **CLOSELY SUPERVISE PUPILS** TO ENSURE THEY DO NOT EAT OR TASTE CHEMICALS

AVOID RAISING DUST – do not inhale any produced
TAKE CARE WITH SENSITIVE SKIN – wear gloves

TAKE CARE WITH HOT WATER – only teacher should use kettle & pour water
Run cold water over a burn or scald for at least ten minutes

CRYSTAL CREATIONS

Preparation:

- Ensure the plastic cups / containers you are using do not melt or deform when filled with hot water
- Make sure everything you use is very clean – each speck of dust will 'seed' a little crystal.

Introduction:

Think about where we find crystals in everyday life (e.g. salt, sugar, snowflakes, quartz (sand), diamonds). What other crystals can they find or think of?

What do crystals look and feel like? How can we describe them?

What are the similarities and differences between these crystals? How could they group or categorise them?

Experiment Method:

Do this activity in small groups, pupils must be supervised at all times

<u>For Salt / Epson Salt / Alum Crystals</u>

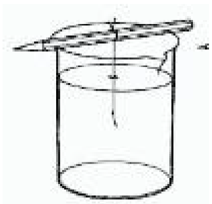
→ Put around 100ml of hot (but not boiling water) into your plastic beaker / cup or container.

→ Add Salt / Epsom Salt / Alum one spoonful at a time, stirring really well each time until all the crystals have dissolved.

→ Keep on adding the solid & stirring until no more dissolves (you have made a *saturated* solution).

→ If you used a shallow container, leave it in a safe warm & well ventilated place to evaporate for a few days. The crystals should grow to produce a crystal 'garden'.

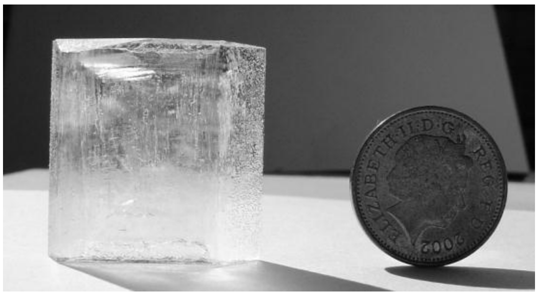
→ If you used a beaker or cup, very carefully tie a small crystal onto a piece of string and suspend the crystal in the saturated solution (e.g. from a pencil). Leave for a few days and you might grow a very large crystal.



- → OR make a shape from a pipe cleaner and suspend that in the solution in the cup. Leave overnight (or longer) then remove it from the solution and let dry on a paper towel. It should then be covered with shiny crystals and can be hung up as a decoration.
- → OR to make a crystal sculpture; fold a piece of card in half & cut out a shape from it. Stand the paper shape in the solution in a shallow container, leave it for several days, and the crystals should grow to cover it.

For large 'Rochelle Salt' Crystals (potassium sodium tartrate)

- → Place one level teaspoonful (about 5 g) of Sodium Bicarbonate in a 100 ml plastic container. Add 50 ml of water and stir well. (The Bicarb is not all that soluble in water and a little solid will be left in the bottom of the container).
- → Add one level teaspoonful of Cream of Tartar. Stir well until the bubbles subside. (They react together to form the Rochelle Salt, potassium sodium tartrate).
- → Repeat this procedure with two more level spoonfuls of Cream of Tartar. (You might notice an interesting effect as the reaction causes a drop in temperature)
- → To make sure that the reaction goes to completion, immerse your container in a bowl of hot tap water. Don't put too much water in the bowl or the plastic container will overturn.
- → Cream of Tartar is only slightly soluble & some will be left undissolved. Filter the solution or pour it into a tall container (e.g. a measuring cylinder); the excess solid sinks to the bottom so that you can pour off the clear liquid into a clean container.
- → If you have a hotplate that you use for cookery, heat the solution in a pan to reduce its volume by about a half, and so concentrate the solution. *This step is not essential though*.
- → Leave the solution in a warm, safe place for several days for the water to evaporate and you might grow a large cuboid crystal.



In case of Thermometer breakage: liquid is non-toxic, mop up with tissues; handle broken glass with gloves, wrap & dispose of safely

(Disposal: throw away solids in the bin & flush solutions away down a drain or sink with plenty of water)

CRYSTAL CREATIONS

Extension Activity:

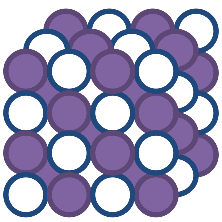
→ Use hand-lenses or microscopes to look in detail at the crystals produced
→ Investigate dissolving in different temperatures of water
→ For colourful crystals, add food colouring
→ Mix different materials to see what types of crystals result. (e.g. salt crystals look different when they are grown with vinegar).
→ Sugar can produce large (but very sticky) crystals
→ Investigate how crystals are formed (e.g. ice crystals form when water freezes, but diamonds & gemstones form deep in the earth under high pressure)
→ Build models of crystal lattice structures, using spaghetti & jelly beans or mini marshmallows

Discussion:

What shapes are the crystal formed?
Are the shapes regular or irregular?
What properties (e.g. colour, transparency) do your crystals have?
How much solid did you dissolve at the start?
Do more crystals dissolve in warm water than cold?

The Science Stuff:

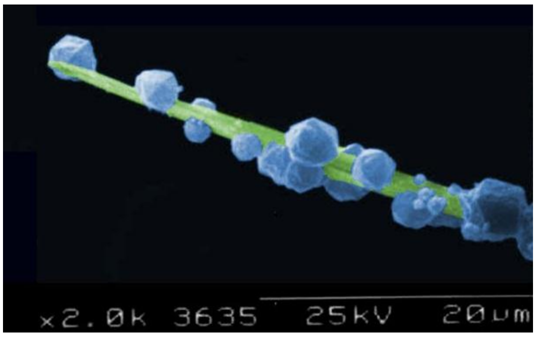
A *crystal* is a solid where its building blocks (the particles ~ atoms or molecules ~ from which it is made) are arranged in a regular, repeating pattern in three dimensions.



Crystals usually have flat faces and sharp angles. Their exact shape depends on how it grows and what it is made of.

A *saturated solution* is one in which no more of the solid will dissolve.

Scientists have now discovered how to grow diamonds in the laboratory, but they are very small! The ones in this picture are only 20 thousandths of a millimetre across.



Diamond Needle, by Dr Paul May
(source: Bristol ChemLabS Gallery 2 www.chemlabs.bris.ac.uk/outreach/primary/WhatIsChemart.html)

CRYSTAL CREATIONS

Comments & Tips:

Label the containers carefully - otherwise everyone claims the best crystals belong to them.

Colourful pictures of crystals can make a good classroom display.

You could have a competition to grow the best crystal 'garden' or the biggest crystal.

Some materials look like crystals, but actually aren't. For example, glass doesn't have an ordered internal structure, so it isn't a crystal. It is *amorphous*.

{please add any useful tips about this experiment based on your experience}

Source:

My Learning, Creative Minds Yorkshire 'Crystal Garden'
www.mylearning.org/learning/investigate/Crystal%20Garden.pdf
Practical Chemistry 'Crystal Garden'
www.nuffieldfoundation.org/practical-chemistry/making-crystal-garden
TLC Science Experiments for Kids 'Crystal Creations'
http://tlc.howstuffworks.com/family/science-experiments-for-kids4.htm
CLEAPSS Primary Science Newsletter 31 'Growing Crystals Safely'
www.cleapss.org.uk/attachments/article/0/PST31.pdf?Primary/Resources/PST%20Newsletters