FOOD & HEALTHY EATING

A collection of experiments investigating food and linking to the topic of healthy eating

Curriculum Links

Sc1 Testing ideas, planning investigations, collecting & using evidence, making observations & measurements, evaluating & presenting results

Sc2 Nutrition & the importance of an adequate and varied diet for health

Summary of Experiments

General Format: Whole class with small groups (each approx 5 children) or carousel with small groups (each approx 6 children) on each experiment

- TESTING FOR VITAMIN C ~ in samples of fruit juices
- TESTING FOR STARCH ~ using a colour-change reaction
- TESTING FOR FAT ~ by careful observation
- TESTING FOR PROTEIN ~ using a colour-change reaction
- CAN FOOD CLEAN COINS? ~ testing the properties of different foods
- DANCING FOOD ~ observe how static electricity & gas make foods move
- ICE-CREAM IN A BAG ~ a recipe which is simple, but tasty!

Health & Safety Considerations

NB. ALL FOOD ITEMS TO BE PROVIDED BY SCHOOL DUE TO HEALTH & SAFETY LIMITATIONS (THEY CANNOT BE STORED IN CHEMISTRY DEPT)

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

! NO EATING OR DRINKING IN THE LABORATORY
! ALWAYS WASH YOUR HANDS AFTER DOING SCIENCE
! DISCARD ALL FOOD SAMPLES IMMEDIATELY AT END

Box Development by: *Sarah Earle, Elmlea Junior School*

TESTING FOR VITAMIN C

Use a colour-changing reaction to investigate the levels of Vitamin C in different fruit juices

Learning Objective: *To test a sample and compare the results*

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

- *100ml* 1% DCPIP solution (2,6-dichlorophenol-indophenol) * Keep in Fridge
- *6* Sample trays
- *6* Plastic pipettes
- *6* Plastic stirring rods - 150mm *
- *1-2* pH paper strips (books/rolls)

Resources you need to provide:

- Range of fruit juices/drinks e.g. orange juice, water, milk, squash

SAFETY

COVER CLOTHES AND TABLES – DCPIP WILL STAIN!
WEAR LAB-COATS OR SIMILAR (E.G. PAINTING APRONS)

NO EATING OR DRINKING
WASH HANDS AT END
DISCARD ALL FOOD SAMPLES AT END

1% DCPIP is Low-Hazard
- – 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

Preparation:

- COVER CLOTHES AND TABLES – DCPIP WILL STAIN!

TESTING FOR VITAMIN C

Introduction:

Show selection of drinks (could put pictures on whiteboard) – what is in these drinks?

What does orange juice contain? Is that the only one with Vitamin C?

Predict which drinks contain most Vitamin C

Experiment Method:

→ Demonstrate DCPIP test for Vitamin C ~ using the pipette, add 1 drop of dark purple DCPIP into drink sample (stir using the rod, not the pipette)

→ The purple colour turns clear if Vitamin C is present

→ In pairs test drink samples (could record in a table, Drink/Prediction/Result)

(Disposal: flush away down a drain or sink with plenty of water)

Extension Activity:

→ Try adding more drops of DCPIP – how many drops does it take to go clear? (less drops to go clear = more vitamin C)

→ Try pH paper test for acid (dip a strip into each sample)

Discussion:

Which drink contained most Vitamin C?

Why is Vitamin C important in our diet?

What other foods/drinks contain Vitamin C?

TESTING FOR VITAMIN C

The Science Stuff:

Vitamin C (also called Ascorbic Acid) is an essential nutrient for humans, it helps keep our cells healthy

Its chemical formula is $C_6H_8O_6$

Vitamin C cannot be stored in the body, so you need it in your diet every day

Comments & Tips:

There are lots more food related activities here: www.foodafactoflife.org.uk, including 'Nutrient Cards' listing the different amounts of nutrients for a variety of foods.

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

Source:

British Nutrition Foundation 'Testing Foods for Vitamin C'
www.foodafactoflife.org.uk/attachments/ff2caf4a-75e5-4aa129132873.pdf

Practical Biology 'Measuring the Vitamin C content of foods and fruit-juices
www.nuffieldfoundation.org/practical-biology/measuring-vitamin-c-content-foods-and-fruit-juices

TESTING FOR STARCH

Investigate the Starch content of foods using a colour-change reaction

Learning Objective: *To test a sample and compare the results*

Resources provided in Box

(equipment also used in other experiments)*

- *100ml* Iodine solution (I in KI)

- *30* Clear plastic petri dishes
- *6* Plastic stirring rods - 150mm *
- *6* Plastic spoons/spatulas
- *6* Plastic pipettes
- *6* Stopwatches *

Resources you need to provide:

- Selection of uncooked food e.g. rice, apple, potato, cereal, crackers…

SAFETY

WEAR EYE-PROTECTION – SAFETY GLASSES OR GOGGLES
WEAR LAB-COATS OR SIMILAR (E.G. PAINTING APRONS)
COVER CLOTHES AND TABLES – IODINE SOLUTION WILL STAIN!

NO EATING OR DRINKING
WASH HANDS AT END
DISCARD ALL FOOD SAMPLES AT END

Iodine Solution is Low-Hazard

– 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

Preparation:

- COVER CLOTHES AND TABLES – IODINE SOLUTION WILL STAIN!

TESTING FOR STARCH

Introduction:

Show selection of foods (could put pictures on whiteboard) – what is in these foods?
Support to identify foods for energy, can be split into fats, sugars and starches.
Predict which foods contain most starch.

Experiment Method:

→ Demonstrate Iodine test for starch ~ put 1 drop of brown Iodine solution onto food sample
→ The Iodine turns black if starch is present
→ In pairs test food samples (could record in a table Food/Prediction/Result)

Extension Activity:

→ Put food samples in order of how much starch they contain by timing how long it takes for the colour to change

→ Investigate how saliva breaks down starch
→ Produce a 'saliva solution' by rolling a mouthful of water round your mouth for a while (Hygiene – ensure each child producing 'saliva solution' uses their own cup.)
→ Mix the saliva solution with the food & then test with the Iodine solution – it should lighten and then completely disappear (may take 5 - 15 minutes)

Discussion:

Which food contained most starch?
Which energy type is best for us to eat?

TESTING FOR STARCH

The Science Stuff:

Starch is a molecule that plants make in order to store sugar, it is a form of 'carbohydrate'.

If we eat food containing starch, as part of the digestive process an enzyme (amylase) in our saliva breaks down the starch into smaller sugar molecules (glucose, maltose and dextrin) which are turned into energy.

Comments & Tips:

Don't use paper plates because they test positive for starch themselves!

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

Source:

British Science Association NSEW Challenge Pack 'Food for Thought'
www.nationalstemcentre.org.uk/elibrary/file/16904/FoodForThought.pdf
British Nutrition Foundation 'Testing Foods for Starch'
www.foodafactoflife.org.uk/attachments/92592385-dfb2-4ad6d61cf053.pdf

TESTING FOR FAT

Investigate the Fat content of different foods by careful observation

Learning Objective: *To test a sample and compare the results*

Resources provided in Box

- *30 sheets* Sugar paper A4, white
- *2 rolls* Lab roll
- *6* Plastic pipettes
- *100* Cotton Buds

Resources you need to provide:

- Selection of food e.g. peanut butter, oil, margarine, milk, cake, bread, crisps etc.
- Pencils

SAFETY

NO EATING OR DRINKING
WASH HANDS AT END
DISCARD ALL FOOD SAMPLES AT END

Preparation:

- You may wish to decant some food out of their original containers into small plastic bowls, or similar

TESTING FOR FAT

Introduction:

What is fat?

What foods (solid and liquid!) do you think contain lots of fat?

Experiment Method:

- → Draw 6 - 9 circles on a piece of sugar paper
- → Label each circle with one of the foods you will be testing
- → Label one of the circles 'water'
- → If the food is solid rub a bit of it (using lab roll or cotton buds), into its circle
- → With liquid food/drinks use the pipette to put a few drops into the circle (make sure you use a clean pipette for each different food)
- → Put a few drops of water onto the water circle
- → When the circles are quite dry, hold the paper up to the light. A translucent spot (translucent – some light passes through) is a positive test for fat.
- → What do you see?

Extension Activity:

- → Compare the fat content of different types of milk (whole milk; semi-skimmed, cream) and/or different sorts of spreads.
- → Try fat spots on different sorts of paper – which paper is best for fat-testing?

Discussion:

Which foods contained the most fat?

Was it easy to tell?

Are fatty foods good for you?

TESTING FOR FAT

The Science Stuff:

The test for fat is simply to squash a sample of food onto a piece of paper and leave it to dry. Both water and fat produce a spot by filling in the spaces between the fibres and the paper. Spots made by water in the food evaporate in the air (and dry) but the fat globules remain. A positive test is a translucent stain around the food sample when you hold the paper up to the light.

Fat has an important place as part of a balanced diet. Fats provide a source of energy and contain fat-soluble vitamins. Stored beneath the skin, fat also helps to insulate us from the cold.

However too much fat, (or too much carbohydrate and protein which the body may convert to fat), can lead to becoming over-weight. It's important to balance the amount of energy containing foods you eat with the amount of energy that you use.

Comments & Tips:

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

Source: *British Science Association NSEW Challenge Pack 'Food for Thought'*
www.nationalstemcentre.org.uk/elibrary/file/16904/FoodForThought.pdf

TESTING FOR PROTEIN

Investigate the Protein content of different foods using a colour-change reaction

Learning Objective: *To test a sample and compare the results*

Resources provided in Box

- *100ml* Biuret solution
- *12* Test tubes
- *1 or 2* Test tube rack
- *6* Plastic pipettes
- *1 litre* Distilled water
- *6* Spatulas
- *6* Plastic beakers (50ml)

Resources you need to provide:

- Selection of food/drink e.g. egg white, milk, lemonade, yogurt, fruit puree 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
DISCARD ALL FOOD SAMPLES AT END

BIURET SOLUTION IS **IRRITANT** (CONTAINS DILUTE SODIUM HYDROXIDE & DILUTE COPPER SULPHATE)

IMMEDIATE REMEDIAL MEASURES ~ ACT QUICKLY & then see a doctor IF:

In the eye ~ Flood the eye with gently-running tap water for 10 minutes.

Swallowed ~ Do no more than wash out the mouth with water. Do not induce vomiting. Sips of water may help cool the throat and keep the airway open.

Spilt on skin or clothing ~ Remove contaminated clothing. Drench the skin with plenty of water & wash well with soap. If a large area is affected or blistering occurs, see a doctor.

TESTING FOR PROTEIN

Preparation:

- Decant the food / drink samples into the small plastic beakers - this will make it easier to pour them into the test tubes.
- If the food samples are too thick to pour easily, dilute with a little deionised water and mix with a spatula
- Liquid samples can be prepared from solid foods: crush the solid food, add a little de-ionized water and decant the liquid. This liquid should be used for the test.
- Separate egg whites from yolks (if using)

Introduction:

What is protein?

Which foods do you think contain protein?

Why do we need to eat protein?

Experiment Method:

→ Pour approx. 2 ml of each liquid food sample into a clean, dry test tube

→ (You could use egg white as a 'positive control' – definitely contains protein – & deionised water as a 'negative control' – definitely doesn't)

→ Add approx. 2 ml of Biuret Reagent to each sample and shake gently to mix

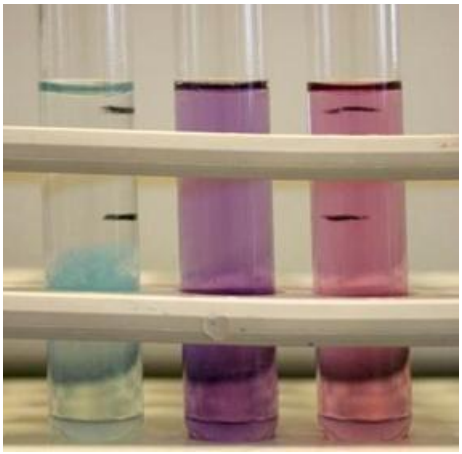
→ Allow the tubes to stand for about 5 minutes & observe the Biuret reagent – does it change colour?

→ Record your results

→ If the solution turns from blue to purple, Proteins are present

→ If the solution turns from blue to pink, Peptides are present (peptides are short bits of protein, e.g. enzymes)

→ No change /The solution remains blue, No protein is present



(Disposal: flush away down a drain or sink with plenty of water)

TESTING FOR PROTEIN

Extension Activity:

→ How long does the colour change take to happen?
→ Can you put the samples in order of how much protein they contain?

Discussion:

Which foods contained protein?
Was it easy to tell?
Were they the ones you predicted?

The Science Stuff:

The Biuret reagent is not named after someone but a substance called 'biuret' ($H_2NC(O)NHC(O)NH$) - the simplest peptide that can be detected using this test.

The Biuret test is based on the ability of Copper to bond with specific molecules (peptide bonds) found in proteins. The copper forms a violet coloured 'complex' with peptide bonds.

Peptide bonds are found in peptides, polypeptides and proteins, all of which give a positive result for the biuret test and are collectively known as protein.

A peptide is a short chain of amino acids. Amino acids are small molecules which are the building blocks of life. A polypeptide is a long-chain of amino acid residues. A protein consists of one or more polypeptides which are folded together, so that it performs a biological function.

Some of the foods tested will have a combination of peptides, polypeptides and protein and it is impossible to tell the relative amount of each with this simple test. You would need a machine that detects the amount of different coloured light coming from each sample (a spectrophotometer) to measure actual amounts quantitatively.

Comments & Tips:

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

Source: *Brilliant Biology www.brilliantbiologystudent.com/biuret_test.html*
Kill O'Grange School, 6th Class http://homepage.eircom.net/~kogrange/6th_protein.html

CAN FOOD CLEAN COINS?

Test different foods for their 'cleaning' properties

Learning Objective: *To test a sample and compare the results*

Resources provided in Box

- *100* Clear plastic cups
- *200* Cotton buds
- *2 rolls* Lab roll
- *2 books* pH Paper (small strips)
- *500g* Salt
- *1* Teaspoon

Resources you need to provide:

- Old 1p or 2p coins (i.e. dirty, not shiny)
- Acidic food e.g. vinegar, fizzy drink(s), fresh lemon and/or orange juice, tomato ketchup, milk

SAFETY

NO EATING OR DRINKING
WASH HANDS AT END
DISCARD ALL FOOD SAMPLES AT END

CHECK WHETHER ANY CHILDREN HAVE A CITRIC ACID ALLERGY

KEEP VINEGARS AND SALT WELL AWAY FROM EYES
– in case of eye contact, rinse gently with clean water

Preparation:

- You may wish to decant some food out of their original containers into the plastic cups or some small plastic bowls

CAN FOOD CLEAN COINS?

Introduction:

What do you notice about the colour of these coins?

Have you got any ideas how to clean them?

What is an 'acid'? Do you have any in your kitchen? There are a number of acids that we consume directly or use in cooking ~show examples

Acids are often natural cleaners. Which of the foods we have do you think will be the best cleaners?

Experiment Method:

→ How will we tell if the pennies are any cleaner? (Keep some pennies un-cleaned for comparison, include water as one of the test liquids)

→ How will we make sure that your tests are fair?

→ Either soak pennies in a small amount of liquid - 50-100 ml in a plastic cup. (Without salt, pennies will need to be left for 10-15 minutes. With salt, the cleaning process is almost instant.)

→ Or use cotton buds to rub acid onto coin and leave for 10 mins on a piece of lab roll.

→ Both soaked and rubbed coins should be washed and dried with lab roll before judging.

Extension Activity:

→ Try adding a 'pinch of salt' to the cleaning solution – does it improve or speed up the cleaning process?

→ Test the different liquids with pH paper to find out their acidity

Discussion:

Which acids worked best? (e.g. fastest/most shiny)

Does their ability to clean coins relate to their acidity?

CAN FOOD CLEAN COINS?

The Science Stuff:

The pennies are largely made from the metal copper and they dull over time because the copper reacts slowly with air to form copper oxide. Pure copper is bright and shiny, copper oxide is black. When you place pennies in an acid solution, the copper oxide dissolves leaving behind shiny, clean pennies.

Suitable acids to use may include: Acetic acid (vinegar), Ascorbic acid (otherwise known as vitamin C) found in citrus fruit such as oranges and lemons, easily accessible as fruit juice. Carbonic acid –any fizzy drink contains a small amount carbonic acid as a proportion of the 'fizz' (carbon dioxide) dissolves in the drink.

The stronger the acid (i.e. the lower its pH) the more corrosive it is and the faster the cleaning process. If pH indicator paper or red cabbage water is available, then these can be used to test the relative strengths of different acids.

The pH scale measures how acidic or basic (alkaline) a substance is. The pH scale ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic and greater than 7 is basic.

A teaspoon of salt (sodium chloride) to each quarter cup of liquid vastly speeds up the cleaning process. The reason why is complicated ~ it involves the conductivity of solution and the concentration of dissolved copper ions.

14	Liquid drain cleaner, Caustic soda
13	bleaches, oven cleaner
12	Soapy water
11	Household Ammonia (11.9)
10	Milk of magnesium (10.5)
9	Toothpaste (9.9)
8	Baking soda (8.4), Seawater, Eggs
7	"Pure" water (7)
6	Urine (6) Milk (6.6)
5	Acid rain (5.6) Black coffee (5)
4	Tomato juice (4.1)
3	Grapefruit & Orange juice, Soft drink
2	Lemon juice (2.3) Vinegar (2.9)
1	Hydrochloric acid secreted from the stomach lining (1)
0	Battery Acid

pH Scale *showing examples of some solutions and their respective pH's*
(from the Chemical Education Digital Library
http://chemteacher.chemeddl.orgservices/chemteacher/index.php?option=com_content&view=article&id=97)

CAN FOOD CLEAN COINS?

Comments & Tips:

The metal alloy used to make pennies hasn't always been the same. Only some pennies are attracted to magnets according to their age. With sufficient pennies, it should be possible to discover in which year the alloy was changed.

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

Source: *British Science Association NSEW Challenge Pack 'Food for Thought'*
www.nationalstemcentre.org.uk/elibrary/file/16904/FoodForThought.pdf

DANCING FOOD

To see how static electricity and gas can make different foods move

Learning Objective: *To observe and explore*

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

- *3* Woollen rubbing cloths
- *3* Glass friction rods
- *3* Perspex friction rods
- *3* Ebonite friction rods
- *3* Polythene strips
- *1* Perspex Sheet
- *1* Balloon
- *30* Clear plastic cups
- *6* Stopwatches *

Resources you need to provide:

- Selection of cereal e.g. puffed rice
- Fizzy Water / Lemonade in clear bottles
- Raisins, nuts, grapes, glace cherries, other dried fruit and peel etc.

SAFETY

NO EATING OR DRINKING
WASH HANDS AT END
DISCARD ALL FOOD SAMPLES AT END

MOP UP ANY SPILLS TO PREVENT A SLIP HAZARD.

Note:

- You may wish to do these activities separately or together
- Experiments with static electricity work best on dry days which are not humid.

DANCING FOOD

Introduction:

Cereal

What will happen when I rub this inflated balloon against my jumper?

What does it do to my hair?

Why does it stick against the wall? How long will it stay there? What is pulling it down?

Fizzy Drinks

What gives the 'fizz' to fizzy drinks? When do drinks 'fizz'? For how long?

What will happen if I drop (e.g.) a raisin in a glass of water? What about a glass of fizzy water?

Experiment Method:

Cereal *(Make sure your hands are clean & dry)*

→ Pour a few handfuls of breakfast cereal onto a clean, flat surface.

→ 'Charge' the different rods by rubbing them with a woollen cloth. What happens when you bring a rod near the cereal?

→ Place a few small boxes or similar around the edges as supports and lay the Perspex over the top. Use the cloth to rub the Perspex as if you are polishing it.

→ What happens to the cereal? Can you explain what you see?

→ Try different cereals to find the best movers(s).

Fizzy Drinks

→ Drop a raisin into a cup or bottle of fizzy liquid, wait and watch it rise and fall.

→ What questions could we ask? E.g. What/Why is it happening? How many times can one raisin rise and fall in a minute? How long will the food keep dancing for?

→ Try different foods & drinks to see whether they behave in the same way

Extension Activity:

→ What happens when you use a mixture of different cereals?

→ If you have other pieces of cloth available, e.g. silk, fake fur, nylon, cotton, polyester, PVC, try using them to charge the rods ~ does it make any difference?

→ Does the type of fizzy drink used affect how the food items dance?

→ Do foods move more or less in a large bottle?

DANCING FOOD

Discussion:

Which cereals were the best dancers?
Why did the bigger cereals not move so much?

Which foods danced best / longest in the fizzy drinks?
Why were some better than others? Look at them carefully, perhaps under a microscope or magnifying glass…

The Science Stuff:

Cereal

Everything is made of tiny particles (atoms). These can carry an electrical *charge* – positive (+), negative (-) or neutral (none) – and these charges can be transferred between materials. By rubbing the Perspex sheet or a rod, you transfer some charge, building up a positive or negative charge, depending on the material.

Two things with the same charge repel (push away from) each other. Opposite charges attract each other. If something is charged it will also attract a neutral object (like the charged rod attracts the neutral cereal).

By rubbing the Perspex sheet the charge builds up and attracts the cereal upwards, but the attraction (charge) doesn't last long. When it wears off the force of gravity pulls the cereal back down again. This cycle carries on as long as you keep adding charge (rubbing). Heavier cereals are more susceptible to gravity and so tend to be less mobile in this experiment.

'Static' electricity is an imbalance of positive and negative charges. When a highly charged object comes near something with the opposite charge a spark may jump between the two.

For a good, simple explanation of static electricity and more experiments see: www.mos.org/sln/toe/staticintro.html (The Museum of Science, Boston)

A list of some common materials and how much 'static' they produce can be found here: http://science.howstuffworks.com/transport/engines-equipment/vdg1.htm

DANCING FOOD

Fizzy Drinks

Fizzy drinks are produced by injecting carbon dioxide into the drink at pressure. When the pressure is released (bottle opened!) the carbon dioxide comes out of solution forming numerous bubbles and releasing gas back into the air. After a few hours, most of the carbon dioxide has been released and the drink is said to be 'flat'.

When you add an item such as a raisin to a glass of fizzy liquid, at first the raisin sinks because it is denser or heavier than the drink. As bubbles of carbon dioxide attach themselves to the surface of the raisin, its mean density becomes less and the raisin rises to the surface.

At the surface, the bubbles burst and the raisin sinks to start the cycle all over again. As the fizzy drink begins to go flat the rate of rising and sinking will slow. Eventually there is insufficient carbon dioxide coming out of solution to carry the food up.

The best 'dancers' are those foods which have a rough or dimpled surface that collects lots of bubbles.

Comments & Tips:

Have a fizzy drinks 'dance competition'. Encourage children to set the rules for it to make it as fair as possible e.g. starting together, same fresh fizzy drink, same sort of container etc. The winner could be decided by counting the number of visits to the surface in a set period of time. Create a winners' podium to display the best 'dancer'

The fizzy drinks activity could be linked to teaching of forces. In the introduction think about forces ~ what makes something move? ~ and different kinds of forces

The cereal activity could be linked to the teaching of electricity. In the introduction think about electricity ~ has anyone ever got a little static 'shock' when they have touched something or someone?

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

Source:

British Science Association NSEW Challenge Pack 'Food for Thought'
www.nationalstemcentre.org.uk/elibrary/file/16904/FoodForThought.pdf
British Science Association NSEW Challenge Pack 'Domestic Science'
www.britishscienceassociation.org/web/NSEW/GetInvolved/NSEWActivities/ActivityPacks.htm

ICE CREAM IN A BAG

A simple recipe for making tasty ice-cream ~ without a freezer!

Learning Objective: *Understand changes of state by making observations*

Resources provided in Box

As the ice cream will be consumed, all ingredients & utensils etc. will have to be provided by the school!

Resources you need to provide:

Amounts for one class (30 pupils)

- *3 x 500ml bottles* Yazoo Milk Drink (chocolate and strawberry)
- *Approx 250ml / ½ pint* Fresh Milk (for teacher demo)
- *150 g* Caster sugar
- *30* Wafers
- *1 kg* Salt
- *7 bags* Blue bags ice cubes *(approx. 35 cubes per bag)*
- *10* Small zip-seal bags (approx. 12x12 cm)
- *20* Large zip-seal bags (approx. 20x20cm))
- *5* Large bowls e.g. washing-up bowl (to shake over)
- *5* Plastic cups (for measuring)
- *5* Tablespoon measures
- *5* Spoons (for serving)
- *10* Small bowls (for serving)
- *2 rolls* Paper towel
- *Each child to bring in* Pair of warm gloves

SAFETY

CHECK FOR FOOD ALLERGIES AMONG CHILDREN
REQUIRES ADULT SUPERVISION
WASH HANDS AT START
DO NOT USE ANY EQUIPMENT FROM KIT BOX FOR FOOD PREPARATION
! WEAR GLOVES TO HANDLE ICE

ICE CREAM IN A BAG

Preparation:

- Clean tables
- Get ice out of freezer at last minute

Introduction:

When it's cold/snowing what happens to the roads & pavements?
What is put on the roads? (Salt & Grit)
Why? (Makes it safer!)
How? (We'll find out…)

History of ice cream – how did they make ice cream before freezers?
Could I turn this flavoured milk into ice cream? How?
How about without a freezer? In this room?

Experiment Method:

In small groups of 3 *(share bowls, cups, measures etc. between 2 groups)*

→ First wash your hands
→ Mix 125ml* of flavoured milk with 1 tablespoon of sugar in the small zip-seal bag.
→ Make sure it is sealed really tightly! (Adult should check)
→ Fill a large bag with ice cubes and add 6 tablespoons of salt.
→ Put the small bag of ice-cream mixture into to the large bag of salt and ice.
→ Put that in another large bag and make sure all the bags are sealed really tightly!
→ Take turns to shake the bag hard for 5 minutes, over a big bowl. Don't forget to wear your gloves while you do this!
→ When the ice cream is set (Adult should feel through the outer bag to check if it is solid) decant into serving bowl and grab a wafer each.
→ Share & enjoy!

** 125ml is just over ½ a cup*

ICE CREAM IN A BAG

Extension Activity:

→ Meanwhile, an adult could spend same amount of time shaking a bag with plain milk where the ice doesn't have any salt in. Also compare a bag with ice and salt but which is not shaken.

→ Will adding other ingredients change the consistency of the ice cream?

Discussion:

What has happened to the liquid milk? How has it changed state?
Is this change reversible or irreversible? Why is that?

Why is the salt important? What is it doing to the ice?
(compare with what has happened in the teacher's salt-less bag)

Why do we need to shake the plastic bags? What happens if you don't?
(compare to the teacher's unshaken one)

What is it that salt does that makes it useful here and on roads?

The Science Stuff:

Salt lowers the freezing point of water. Water normally freezes at 0ºC, but a salt solution will freeze at -10ºC.
This means that the ice and salt mix is very cold (below 0ºC) and it takes heat from the ice cream mixture, so that becomes cold too. However, because the ice cream mixture is mostly water, but contains no salt, when it reaches 0ºC it does freeze and becomes a solid.

Spreading salt on the roads means that the air temperature has to get below -10ºC for any rain or snow to freeze into ice, making it safer and less slippery.
Interesting point – in very cold countries like Russia there is little point in putting salt on roads as it is usually below -10ºC so the water would freeze anyway.

ICE CREAM IN A BAG

Comments & Tips:

Fits in with Y4 'Keeping Warm' Unit

You could research the history of ice cream ~

Ice lollies have been recorded in history as far back as Ancient Egypt. The Roman Emperor Nero would demand snow be brought down from the mountains and mixed with fruits for his enjoyment. Since then ice lollies and ice cream have never gone out of fashion. The Victorians used to import ice to London from Norway (see: www.canalmuseum.org.uk/ice/index.html).

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

Source: *Science Museum 'Ice cream - it's in the bag'*
www.sciencemuseum.org.uk/educators/classroom_and_homework_resources/resources/ice_cream