Baylab

British Science Week booklet

INSPIRING A LOVE OF SCIENCE

It is an EXCITING time in the **Baylab** in the run up to BRITISH SCIENCE WEEK. So that you can get involved we have developed five EASY EXPERIMENTS for you to try at home. Whether it is making some tasty ICE CREAM or a mesmerising LAVA LAMP, we have many activities to keep everyone busy. For older students you may want to dive into the WORLD OF DNA, or for the younger members some sticky and messy fun with MAKING SLIME. Maybe you even want to try your hand at some MAGIC SCIENCE with eggs, how egg-citing!

Find the instructions for all these activities in our British Science Week booklet. To make it even easier, go to our YouTube page at www.youtube.com/BayerUKIre to follow along with our video tutorials. Discover your passion for science this British Science Week!

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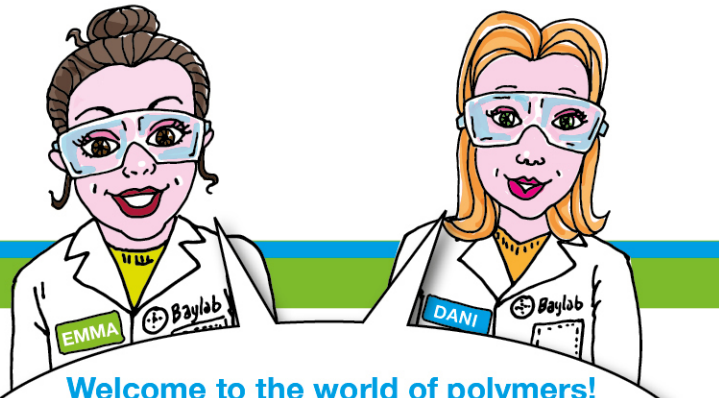


MAKING SLIME

Welcome to the world of polymers! Making slime is a fun and relaxing way to see the reaction that takes place between PVA glue and the activator. This is how you can make some super simple slime!

WHAT YOU WILL NEED

- PVA glue (White or clear)
- Slime activator
- Plastic spoon

- Plastic cup
- Measuring cylinder or weighing scales (assume 1ml = 1g)
- Cornflour (optional)

- Food colouring (optional)

- Small resealable bag (for storage)
- Glitter (optional)

METHOD

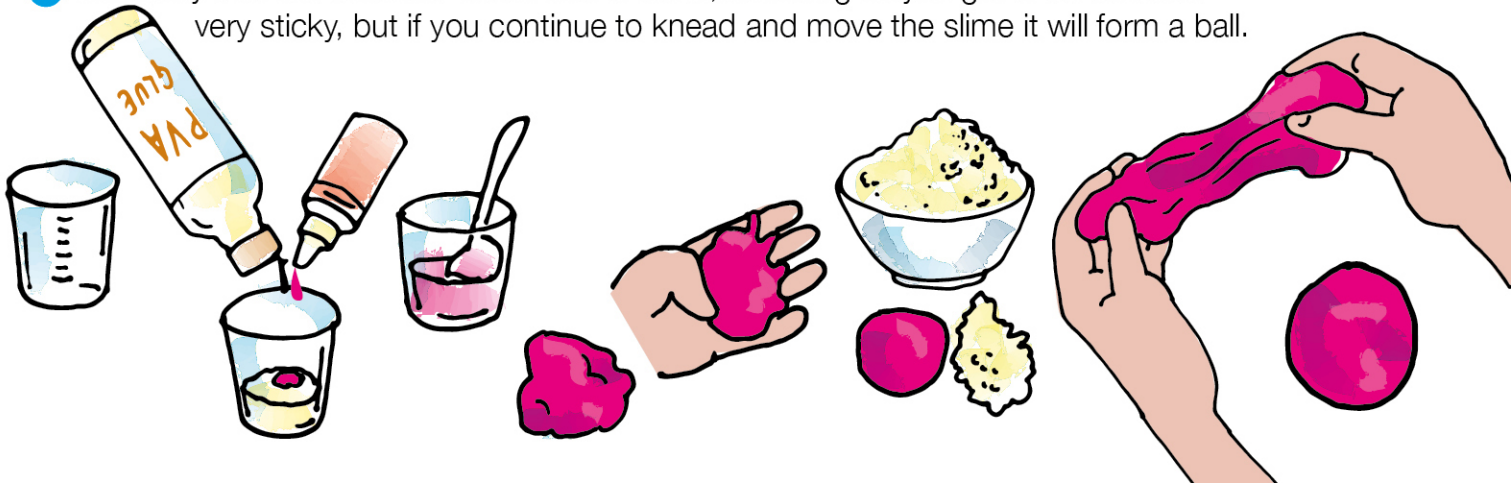
We recommend doing this experiment on a tray and away from any carpet as it can get very sticky!

Slime base:

1. Measure out 30ml of PVA glue into a plastic cup – this will be about a quarter of a cup.
2. Now is the time to customise your slime: we recommend adding 5-10 drops of food colouring. You could add some glitter at this point. Stir the mixture together until the colour (and glitter) is evenly distributed.
3. Now you can measure out 15ml of slime activator – we recommend adding half as much activator as glue. Gradually add it to your PVA glue and stir with your plastic spoon.
4. Once the mixture looks like it is beginning to clump together, pour the slime out onto the your tray and knead it using your hands.

The mixture will feel very wet and slippery. It will begin to take shape after kneading so be patient. At this point if you are happy with your slime, you can stop; however we recommend adding cornflour to give your slime elasticity!

5. Using your scales, weigh out 20g of cornflour.
6. Gradually add the cornflour to the ball of slime, kneading as you go. It will become very sticky, but if you continue to knead and move the slime it will form a ball.



THE SCIENCE BEHIND IT

Slime is a polymer made up of PVA and the activator. A polymer is a chemical compound consisting of repeated units – these are called monomers. PVA has a cross-linked structure which traps a lot of water which makes the slime feel wet. The activator contains ions which react with the PVA to form hydrogen bonds, linking the two together to form a new polymer – slime.

To take this investigation further, you could experiment with different masses of cornflour.

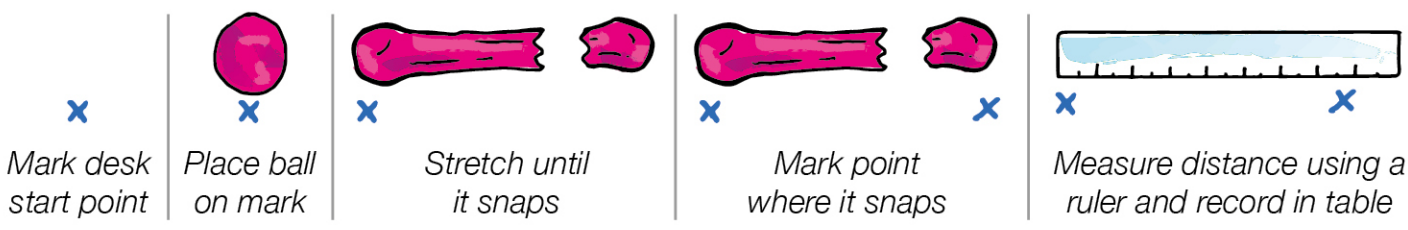
INVESTIGATION

Hypothesis – How does changing the mass of cornflour effect the elasticity of the slime?

Independent variable: *what you will change*	**Control variables:** *what will stay the same*	**Dependant variable:** *what you will measure*
The mass of cornflour.	Mass of the slime. Colour of food colouring. Drops of food colouring. Force applied to slime.	The "stretch" of the slime.

Suggested method:

1. Follow steps 1-4 from the previous page seven times to create seven standard balls of slime.
2. Using the table on the next page, add different amounts of cornflour to each ball of slime.
3. Weigh out each ball to 30g to make it a fair test.
4. Mark a spot on the tray/some paper.
5. Place your slime ball on the spot.
6. Stretch the ball until it breaks.
7. Place the slime down where it breaks and mark this spot.
8. Measure the distance from start to end.
9. Record your results in the table.
10. You can then plot a graph with mass of cornflour (g) along the x-axis and stretch distance (cm) along the y-axis to find the optimum mass of cornflour.



We suggest using the following table:

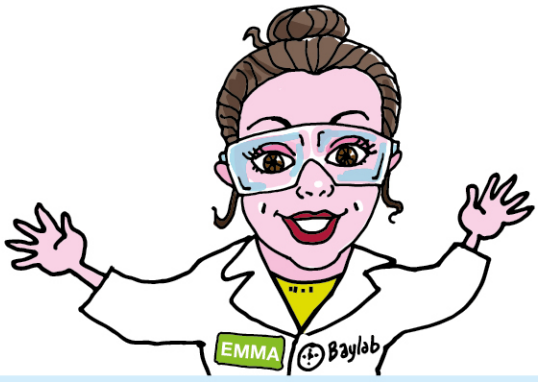
Mass of Cornflour (g)	Appearance	Stretch Distance (cm)
0		
10		
20		
30		
40		
50		
60		

EXTENSION TASK

Hypothesis – How does changing the amount of slime activator added affect the consistency of the slime?

STORAGE

In order to keep your slime stretchy for longer, store it in a resealable bag with all the air pushed out so it is nearly airtight. This will make your slime last a lot longer so you can have hours of fun.



There are lots of different variables to test, so let the scientist in you go wild.
We would love to see your creations so any photos you share on social media please use the hashtag ▶ #BaylabBSW19 or tag @UKBayer or @bayerbaylabs

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These simple steps will leave you with a mesmerising lava lamp you can use again and again. It is a quick and easy experiment for all ages.

MAKING A LAVA LAMP

WHAT YOU WILL NEED

- Screw-lid container

- Food colouring

- Water
- Vegetable oil

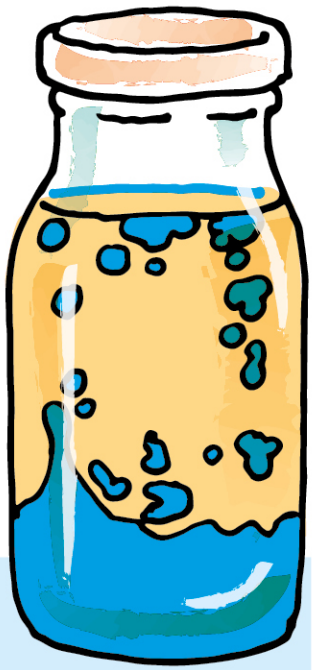
- Salt or an effervescent tablet

A tablet that is designed to dissolve in water, and release carbon dioxide which causes it to fizz.

METHOD

1. Firstly, add water to your container until it is roughly a quarter full.
2. Next, add 10 drops of food colouring or until the colour is vibrant.
3. Top up your container with vegetable oil, leaving about a centimetre at the top. This will allow room for the gases produced and prevent your lava lamp from leaking.
4. To make your lava lamp bubble, add a teaspoon of salt or one crushed up effervescent tablet and screw the lid on tightly.

You can now sit back and relax, watching the colourful bubbles work their way up the oil and slowly sinking down again. If the process stops you can restart it again by adding more salt or another effervescent tablet.



THE SCIENCE BEHIND IT

Water and oil form two layers due to a difference in density. Oil is less dense and as a result appears in a second layer on top of the water.

When you add an effervescent tablet, it reacts with the water making tiny bubbles of carbon dioxide which rise up. These bubbles attach themselves to the coloured water and float up through the oil. When the bubble pops at the surface, the coloured water droplet sinks back down to the bottom of the container.

When you add salt, it sinks down to the bottom of the container, dragging blobs of oil with it. Once the salt dissolves in the water, the oil floats up to the top again.

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EGGS-PERIMENTS

1 BOUNCY EGG

WHAT YOU WILL NEED

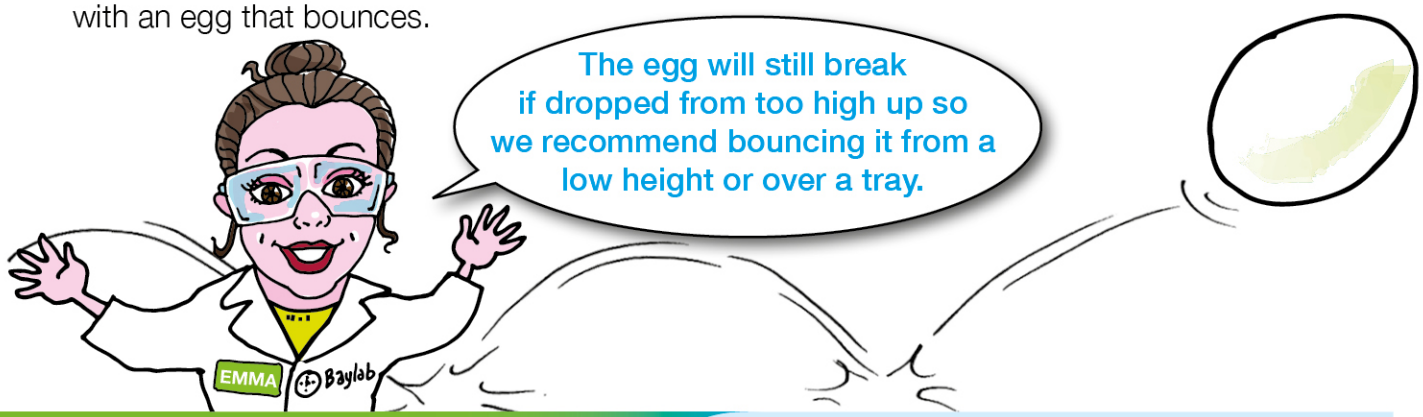
- 1 egg (we recommend a white egg)

- A large container (a mason jar will work well)

- Bottle of white vinegar
- Food colouring (optional)

METHOD

1. Place your egg into the bottom of the large container. It is important that the egg is raw and not boiled.
2. Fill the container with white vinegar, or add enough so the egg is fully submerged.
3. *Optional step:* Add a few drops of food colouring to dye your egg.
4. Leave the egg for 24-48 hours to allow for the reaction to take place.
5. Take the egg out and swill it under some running water. The shell should wash away leaving you with an egg that bounces.



THE SCIENCE BEHIND IT

The acid in the vinegar (ethanoic acid) reacts with the calcium carbonate in the eggs shell. This reaction will dissolve the egg shell producing carbon dioxide, leaving the egg with only a membrane. The membrane surrounding the egg is strong and remains intact meaning your egg will now be bouncy.

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EGGS-PERIMENTS

2 SILVER EGG

WHAT YOU WILL NEED

- 1 egg (we recommend using a brown egg for this one)
- Candle and matches

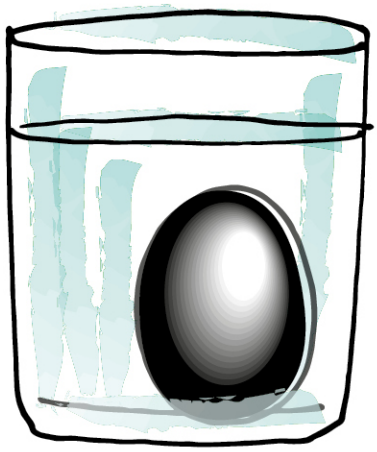
- Large container (a mason jar or beaker)
- Water
- Tongs

METHOD

1. Light your candle and make sure it is on a stable surface away from anything flammable.
2. If you have tongs, you can use these to hold the egg over the flame in order to create a layer of black soot.

Adult supervision: This step can be very tricky as the egg is difficult to hold in tongs. We ask that an adult does this part as the egg can get hot.

3. Once the egg is completely black, fill a large container with water and place the egg inside.
4. The egg will now appear shiny silver.



THE SCIENCE BEHIND IT

If the egg is completely covered in soot, the carbon repels the water and holds a fine film of air. This is what gives the egg the mirror appearance.

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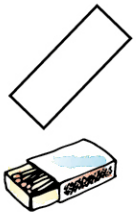
This experiment feels like magic! You can make an egg wiggle its way into a bottle without using your hands! You may want to get the whole family to watch and surprise them with your science skills.

EGGS-PERIMENTS

3 EGG IN A BOTTLE

WHAT YOU WILL NEED

- Hard-boiled egg, peeled
- Milk bottle or container with a wide mouth (not big enough for egg to fit through easily)



- Strip of paper (about 10cm X 2cm)
- Match

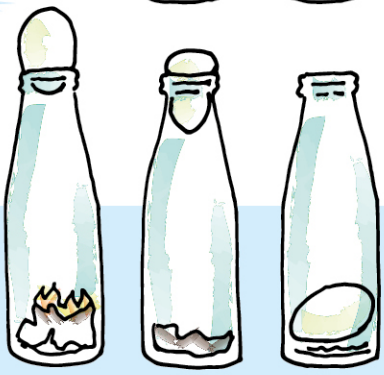
METHOD

To hard boil your egg, place it in a pan of boiling water and allow to simmer for 7-8 minutes. Remove the egg from the boiling water and place straight into a bowl of ice cold water for a few minutes to make removing the shell easier. Alternatively, just wait until the egg has cooled and carefully remove the shell.

1. Show your audience that the egg will not fit inside the bottle – this will increase the wow factor.
2. Light a piece of paper using the match or lighter.
3. Quickly drop the paper into the bottle and place the egg on top – so that it sits on the mouth of the bottle.
4. Watch as the egg wiggles and squeezes its way into the bottle.

This can take a few attempts so don't feel disheartened if you don't get it first time.

5. You will now have an egg in a bottle – you may want to show your audience that the egg will not fall back out of the bottle by inverting it a few times.



THE SCIENCE BEHIND IT

This happens due to changes in air pressure. Burning paper causes a change in pressure due to a change in temperature. As the paper burns, it heats the air in the bottle which causes the air to expand. But as the flame begins to die down, the air inside the bottle cools causing reduction in the pressure inside the bottle. The higher pressure on the outside then pushes the egg into the bottle. *Magic!*

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This exciting experiment will expose DNA in all its glory! We recommend wearing safety goggles when using methylated or white spirit to protect your eyes.

EXTRACTING DNA FROM FRUIT

WHAT YOU WILL NEED

- 10 ml washing up liquid

- 2 plastic cups or small beakers

- 1 small resealable bag

- Strainer/sieve

- Measuring cylinder or weighing scales (assume 1ml = 1g)

- ½ teaspoon of salt

- 25 ml methylated spirit or white spirit

- 90ml water

- Tweezers or a tooth pick

- A strawberry

- Dish or plate

METHOD

Place your methylated spirit in the freezer and leave it over night for best results. It needs to be ice cold!

1. To make your extraction mixture, measure out 90ml of water into the small beaker and add 10ml of washing up liquid.
2. Stir in the salt until it dissolves.

Now you are ready to extract your strawberry's DNA.

3. Place one strawberry into the small resealable bag and pour in the extraction mixture.
4. Seal the bag, removing as much air as possible and, using your hands, mash the strawberry.
5. Once there are no large lumps, pour the mixture through the sieve into another small beaker.
6. Use the back of a spoon to press against the pulp in the sieve to help release as much fluid as possible.

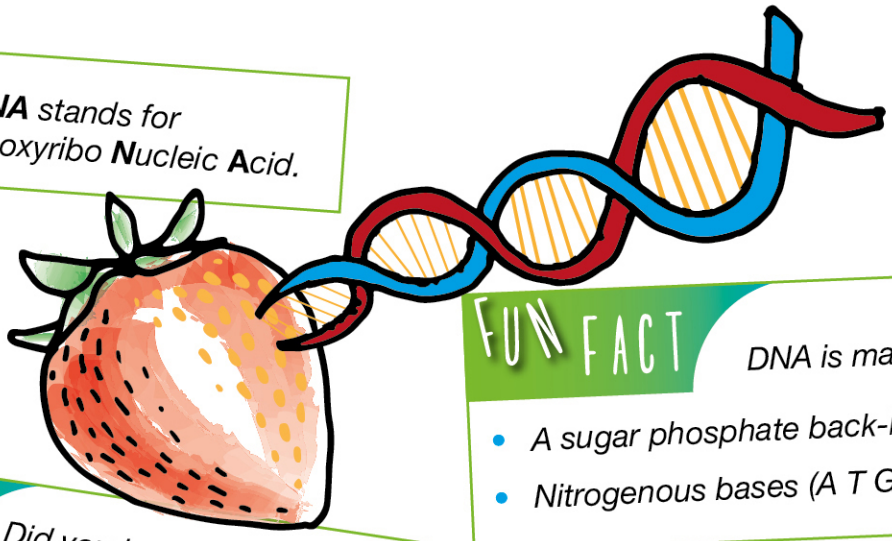
The liquid now contains strawberry DNA.
DNA is soluble in water so you cannot see it.
To make it insoluble follow the next steps so you will be able to see the DNA for yourself.

METHOD

7. Now take the methylated spirit from the freezer and pour it at a 45° angle into the strawberry mixture. This will create two layers – one layer of the solvent and one layer of the mixture.
8. A white jelly-like structure will form where the two layers meet – this is the DNA.
9. Using the tweezers or a toothpick you can remove the DNA and put onto a dish or plate in order to examine it.

FUN FACT

***DNA** stands for **D**eoxyribo **N**ucleic **A**cid.*



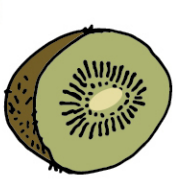
FUN FACT

DNA is made up of:

- *A sugar phosphate back-bone.*
- *Nitrogenous bases (A T G C).*

FUN FACT

Did you know human DNA is 60% the same as a fruit fly?



THE SCIENCE BEHIND IT

Why do we need the extraction mixture? DNA is contained inside the cell in the nucleus. The cell membrane and the nucleus membranes are made of fat and in order to access the DNA we need to be able to break open the cell. Washing up liquid disrupts the membranes by breaking down the fat, releasing the cell and nucleus contents.

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This is a very tasty science experiment! Watch ice cream freeze before your very eyes and it is customisable with any toppings or flavours you like.

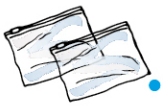
MAKING ICE CREAM

WHAT YOU WILL NEED

- 120ml flavoured milkshake

- 40ml double cream

- Ice cream toppings (optional)

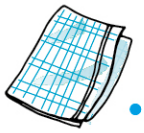


- 2 small resealable bags

- 1 large resealable bag

- Table salt (lots of it)

- Crushed ice



- Tea towel

- Plastic cup

- Measuring cylinder or weighing scales (assume 1ml = 1g)

METHOD

1. Measure out 120ml of flavoured milkshake into a plastic cup and add 40ml of double cream.
2. Mix together your milkshake and cream to combine.

At this point you may also want to add some extras (i.e. chopped fruit, chocolate chips).

3. Now very carefully pour your mixture into a small resealable bag—try to remove as much air as possible.
4. This next step is really important.
   You need to put your resealable bag containing the mixture inside a second smaller resealable bag.
   This is key as it will prevent you ending up with salty ice cream

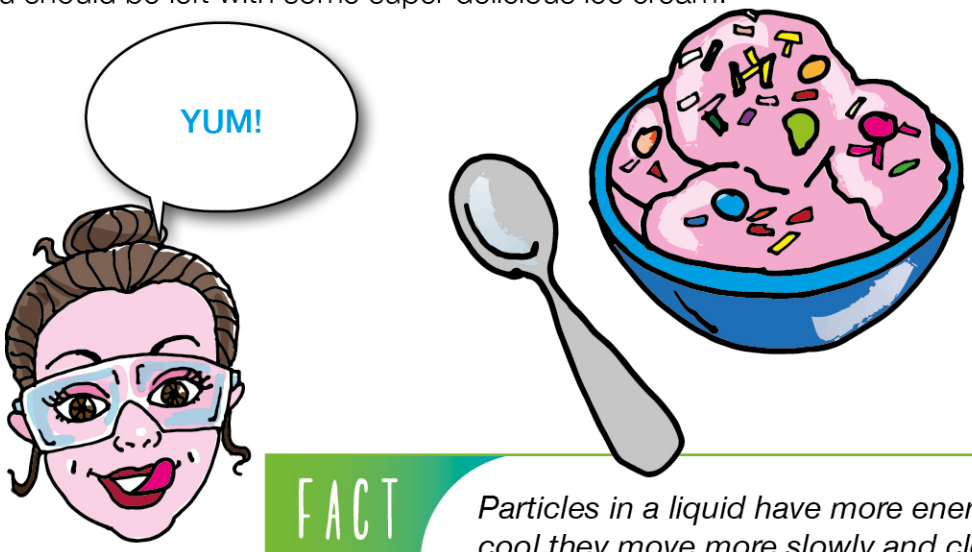
METHOD

Next you need to prepare your ice bag.

5. Fill your large resealable bag about three quarters of the way full with ice.
6. Then add about 3 to 4 handfuls of salt. It needs to be very salty as the reaction with the salt and ice causes your ice cream to freeze.
7. You can add your double bagged ice cream mix into the large ice bag.
8. Using the tea towel, hold the bag and gently massage and shake the mixture to speed up the freezing process. Don't be too vigorous as you don't want to risk breaking any of the bags.

It will take about 15 minutes for the ice cream to solidify fully so be patient.

9. Once you feel the ice cream has thickened and solidified remove it from the ice and open the bag. You should be left with some super delicious ice cream.



FACT

Particles in a liquid have more energy but as they cool they move more slowly and closer together.

THE SCIENCE BEHIND IT

Water normally freezes at 0°c. However, by adding salt it lowers the freezing point so you get super cooled water around the ice cream mixture. This means the water will freeze at -6°c or even -16°c depending on the concentration of salt.

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