



Science at Home

Try out these science ideas from our
Princethorpe Science Ambassadors
and STEAM Prefects

Safety

- Always check at home with an adult before starting an experiment
- Look at the safety advice on each experiment and take care
- Be helpful and tidy up any mess too





Quick and Easy

- These experiments are quick to do
- They use very common household items
- Good Luck

Magic Milk

• What to do

- Pour milk in a dish.
- Squeeze a few drops of food colouring (and glitter) into the milk.
- Dip the end of the toothpick or cotton bud into washing up liquid and then into the centre of one drop of coloured milk. Don't stir it! Watch the colours spread



The Science

The dish soap is disrupting the surface tension of the milk, making the surface molecules spread out and the colours move around.

One end of a soap molecule LOVES water (hydrophilic) while the other side HATES water and loves oil and fat (hydrophobic). Soap can get dishes and clothes clean because the hydrophobic end picks up the grease, oil, and dirt, while the hydrophilic end dissolves in water and washes all the dirty stuff away with it.

Things to Try

What happens when you try skimmed milk versus whole milk? How about something like cream that has lots more fat in it? What about water or vegetable oil?

Safety: Don't drink the milk afterwards



My name is George Saunders and I am a Physics Ambassador, I like physics as it allows you to figure out many phenomena that you see day to day

Physics – Density Experiment

The Science behind this experiment:

Egg whites and oil are hydrophobic and so don't mix with water, this allows us to determine their densities relative to water – lower density will float and higher density will sink.



You need an egg, some olive or sunflower oil, a teaspoon and a glass.



Now remove the egg white and pour it as well as the oil and some water into the glass.



Now stir the mixture to disturb the layers.



Let the mixture settle for 5 minutes and record the layers – this is the order of density. Lowest density at the top and highest density at the bottom.

Safety:

Stand up during the experiment, wash your hands after handling the egg .

Skittle Chromatography

• What to do

- Place your skittles or sweets into a white container, or an plate - arrange them in an interesting pattern
- Carefully pour water into the container, if the skittles move, just push them back into place quickly



Things to Try

Try different temperatures of water, vinegar or lemonade and see what the difference is

Safety: Be careful with hot water

The Science

Skittles are coated in food colouring and sugar. When you pour water over the skittles the coloured coating dissolves spreading through the water.

The colour and sugar **dissolve** into the water and then **diffuse** through the water, making it the colour of the skittle.

Egg in a bottle experiment

What you'll need

- A boiled egg
- A clean, dry glass bottle or jar with a neck a little smaller than an egg
- Matches



Instructions

- Place the cooled boiled egg on top of the glass bottle or jar to check there is no way the egg will drop through.
- Light a match and drop it inside the jar. Quickly place the egg on the top of the jar.
- Watch as the egg drops down inside. Be a little patient with this as the egg doesn't drop down immediately, but should drop slowly once the match goes out.



My name is Tom, and I am physics ambassador. I enjoy physics because you can see the things you learn in lessons in the world around you outside of school, and you can understand why they happen.



The Science

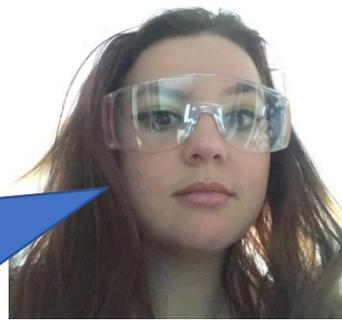
The matches heat up the air inside the glass jar or bottle. The warm air expands and some escapes out of the jar.

After the match goes out, the air starts to cool, and the air pressure drops.

This means the air outside the jar now has a higher pressure than the inside, and pushes the egg into the jar as it is rubbery and flexible.

Safety: Always check with an adult before using matches and take great care you don't burn yourself and check that the match is out properly

Biology -> Colour Changing Celery Experiment



1) Separate the stalks of the celery and chose the ones with the most leaves

2) Add a few drops of food colouring to a glass of water (*Blue or Red food colouring shows up the most!*)

3) Place the celery in the glass of water with the stalk at the bottom

4) Leave the celery for around 2-3 days and watch what happens!



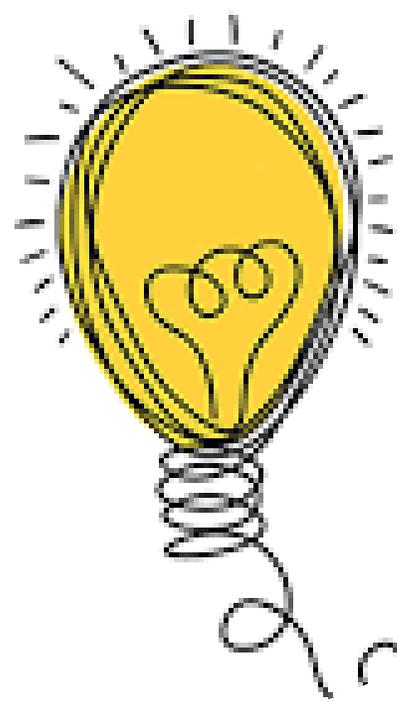
Heya! I'm Lizzie, one of the Biology Ambassadors. I love biology as it allows me to understand the processes of life around me

THE SCIENCE:

Plants such as celery, carrots, and flowers take up water through thin tubes in their stems and tissues known as xylem vessels. As the celery pulls the coloured water up through the xylem, the celery turns the colour of the dye as it spreads through the plant. As water is dragged up the stem it forces more to follow - a process known as transpiration and cohesion.

SAFETY:

Try not to spill any of the colourful water - it would be a waste of fun but also a slip hazard!



Feeling Scientific

- These take a little bit longer
- You might need to add something to your shopping list
- They will get you thinking scientifically



My name is Prajeet Prabakaran and I am a STEAM Ambassador. Today I will be experimenting on yeast and the process of respiration.

All living cells respire. It is a chemical reaction which releases energy from glucose so that all other chemical processes needed for life can happen. Yeast can respire aerobically (with oxygen) and anaerobically (without oxygen).

Biology- Respiration Experiment

Fermentation

Glucose \rightarrow ethanol and carbon dioxide + energy

Aerobic Respiration Equation

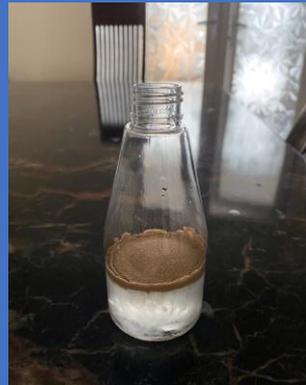
Glucose + Oxygen \rightarrow Carbon Dioxide + Water + energy

You will need:

- A balloon
- A small clear bottle
- A small packet or teaspoon of dried yeast
- Warm water
- 1 teaspoon of sugar



Gather all the equipment. You will need a small bottle about 3cm full of warm water.



Add one teaspoon of dried yeast to the warm water in a small bottle. Make sure you stir well.



Then add one teaspoon of sugar and stir until dissolved. Place the balloon over the open top.



After the bottle is sealed, come back to the experiment every 10 minutes to see the balloon expand! The gas produced is carbon dioxide.

Safety : handle hot water with care, don't let the balloon get too big - it might burst!

Chemistry- Oobleck experiment

The science behind the experiment:

When the cornflour is mixed with the water, the starch particles become suspended in the liquid as the water moves between them. When force is applied, the particles move and lock together and the water moves away from the particles forming a solid which cannot flow.



My name is Lauren Abba and I am a chemistry and biology ambassador, I like both these subjects as it allows you to understand more about everyday life.

What you need

- 1 ½ cups cornflour
- 1-2 drops food colouring
- 2 cups water

- Mix the food colouring with the water
- Add most of the cornflour to the bowl
- Slowly add the water, be careful not to add too much
- If more cornflour is needed, add it
- Try and move the mixture slowly and then quickly and see what happens !!

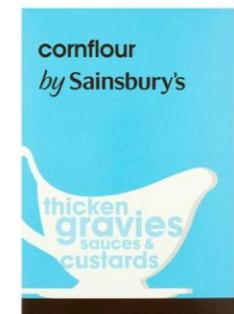
Slowly - acts like a liquid



Quickly - acts like a solid



Safety : *Don't put down the drain it will block it*

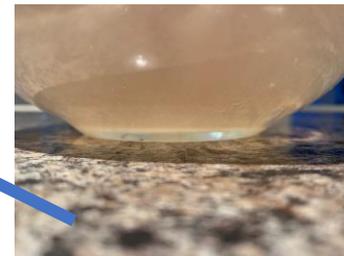


Magic mud – a non-Newtonian fluid

- Remains hard when handled but turns into a liquid when left alone
 - Materials required: potatoes, hot water, (glass) bowls, strainer
- 1) Cut potatoes finely into **very** small segments (you should also have a lot of potatoes!)
 - 2) Put the chopped potatoes into a bowl of hot water and stir for a few minutes
 - 3) Strain the potato pieces from the mixture and leave the water to rest for around 10 minutes
 - 4) You should notice a layer of white solid forming at the bottom of the bowl and the red liquid on top
 - 5) Pour away the liquid so you are left with the magic mud
 - 6) Optional: rinse with water to remove any solid pieces
 - 7) Now you have created magic mud, which is actually the starch from the potatoes!



My name is Alex and I enjoy chemistry because of the exciting practicals!



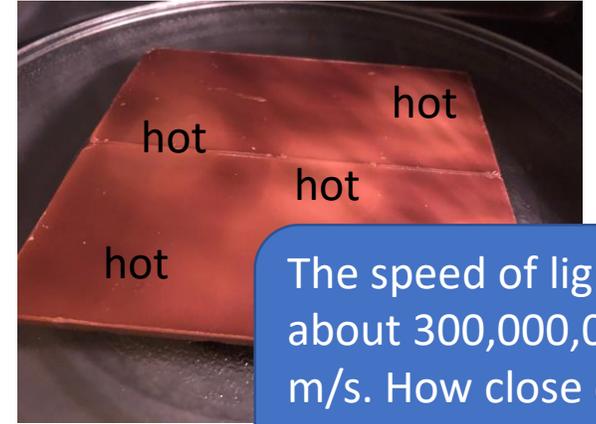
Safety : Take care with boiling water and sharp knives. Don't put down the drain it will block it

Things to Try
Compare to the corn-starch method, which worked better?

Hi, my name is Lauren and I am a STEAM Ambassador. I love science because it answers so many questions we have about the Universe.

Measure the speed of light using chocolate and a microwave

You will need: a microwave, a 30cm ruler, and at least 2 sharing bars of chocolate



The speed of light is about 300,000,000 m/s. How close can you get?

- 1) Find the frequency of your microwave. Mine was 2450MHz. Convert to Hz by multiplying by 10^6 .
- 2) Remove the turntable roller ring from under the plate in the microwave so the plate won't rotate. Put your chocolate bars on the plate next to each other.
- 3) Close the door and run the microwave for 25-30 seconds.
- 4) Take out the plate with the chocolate, you will see some spots are melted and other spots are cold. Carefully, measure the distance between the middles of two consecutive melted spots on the chocolate. In my case it was 6.2cm.



SAFETY: If you want to eat the chocolate afterwards, wash your hands, the microwave plate, and the ruler before you start so it is safe to eat!

The science:

Standing waves are set up in the microwave, so some spots melt because they were heated strongly and other spots stay cold because they weren't heated at all. The distance between 2 melted spots is $\frac{1}{2}$ a wavelength, so double your measurement to get one wavelength.

Make sure you convert it to metres. The wave equation is **speed = frequency x wavelength**. So multiply the frequency of the microwave by your wavelength to find out the speed of the microwaves, which is the same as the speed of light!



Super cooled water

- What to do
- Put a bottle of water in the freezer and leave for 2hrs30min – 2hrs45min. If they have frozen completely it will not work and make sure the bottle isn't touching anything else. If they have not begun to freeze then leave them in the freezer for 5-10 mins more until they are beginning to freeze. You should see some evidence of crystals in the water
- Put an ice cube in a bowl
- VERY CAREFULLY remove the water bottle from the freezer and carefully open the lid and immediately pour over the ice. You should see ice towers start to form

Safety: Be aware of really cold substances on your skin



Things to Try

Pour the super cooled water on frozen fruit or add food colouring to make different coloured towers

The Science

In order to freeze, water needs a nucleation site – somewhere for the ice crystals to grow. Without this you can actually cool water to below its freezing point before it actually becomes solid

You need to take it out really carefully because knocking the bottle can initiate the freezing process! As you pour the water onto the ice it instantly freezes.



Share your Success

- Send in a picture or video of your experiments with a something about what you've learnt
- Merits for all who take part
- Prize for the best video or picture with an explanation of what you did
- Send to fayeroberts@princethorpe.co.uk
- Deadline - Friday March 19th