BRITISH SCIENCE WEEK 2017

PRIMARY RESOURCE PACK

British Science Week
10 - 19 March 2017
www.britishscienceweek.org

This resource pack aims to be your 'one-stop-shop' for supporting you during British Science Week (BSW), but can be used at any time. Feel free to adapt or extend the activities to suit your students' needs and the curriculum you are delivering.

In addition to the activities in this pack, there are lots of other ways to enthuse and engage your students throughout the Week:

British Science Week events
You can either create your own club, class or school event or search for things happening near you on our website. Last year, there were over 5,000 events reaching more than 1 million people. Help us make British Science Week 2017 even bigger and better! **britishscienceweek.org**

CREST Star Awards
Many of the activities can count towards CREST Star Awards. Further CREST Star resources can be downloaded for free from **crestawards.org/crest-star**

The British Science Week 2017 digital badges
All the activities in this pack, as well as attending events, can enable you and your students to achieve a special British Science Week 2017 digital badge. Register for free at **makewav.es/britishscienceweek** and students can upload evidence of their activities to gain the badge. It's a great way to quickly evidence and reward everyone's hard work.

Demo Day

Taking place on Thursday 16 March, Demo Day is an annual campaign held during British Science Week that aims to inspire school teachers and technicians to explore new concepts, provoke discussions and generate excitement through running science demonstrations. Many activities found in this pack are suited to Demo Day, simply look for the 'Wow' symbol above. Share what you got up to on Demo Day by using the hashtag #DemoDay17 **on social media. Stories, photos and videos – the more visual the better!**

Find out more at britishscienceweek.org/plan-your-activities/demo-day

The British Science Week 2017 digital badges

Poster competition

Some of the activities could be followed up by designing a poster, simply look out for the paintbrush symbol above. The theme for this year's competition links with this year's activity pack theme of 'change'. For more information on the competition and how to enter, read on further in the activity pack or visit britishscienceweek.org/plan-your-activities/poster-competition

Photo competition

Try out the new Technicians Make it Happen photo competition. Share an image of a representation of a technician on Twitter to be in with a chance of winning a wonderful array of prizes! To find out more, read on in the activity pack or visit britishscienceweek.org/technicians-make-it-happen

BRITISH SCIENCE WEEK 2017

The theme for this year's British Science Week is "Change", encouraging young people to think about and investigate the changes happening in the world all around us; from seasons and climate, to materials and energy. It is also a chance for young people to consider the changes they can enact to have a positive impact on the future.

BRITISH SCIENCE WEEK 2017

CHALLENGES

WORD SEARCH

Solve the word search full of words related to change. Remember words can be up, down, diagonal and even backwards!

Words:

Climate change
Irreversible
Environment
Slime
Weather
Evolution
Reversible

E	I	G	L	C	E	E	R	P	E	Y	F	R
T	G	W	K	M	G	L	E	V	K	O	R	F
T	L	N	I	T	E	B	H	O	G	X	G	U
R	N	L	A	N	H	I	T	L	K	J	Q	B
E	S	V	O	H	T	S	A	W	J	Q	W	P
V	X	V	D	P	C	R	E	Y	R	R	U	A
E	W	J	H	D	F	E	W	L	Y	W	D	M
R	M	J	E	U	Q	V	T	X	T	V	O	I
S	I	A	N	A	S	E	T	A	Y	C	P	R
I	N	E	N	V	I	R	O	N	M	E	N	T
B	U	O	C	T	Z	R	V	X	M	I	F	X
L	O	D	U	Z	G	I	Q	C	W	K	L	A
E	K	N	O	I	T	U	L	O	V	E	X	C

BRITISH SCIENCE WEEK 2017

CHALLENGES

CATEGORIES

Find the words that fit together best in groups of four, and then give the group a name.

Words:

Einstein	Flooding	Summer	Winter
Humboldt	Earthquake	Gentoo	Newton
Emperor	Hawking	Drought	Rockhopper
Autumn	Spring	Eruption	Darwin

Example

chocolate bars	Dairy Milk	Crunchie	Mars	Snickers

Tip:
if you're struggling to see all the groups in the words above, write down the ones you find first, and see if you can work out what groups are in the words that are left.

BRITISH SCIENCE WEEK 2017

CHALLENGES

ODD ONE OUT

Note: as long as you can give a clear reason to support your idea, then your answer is correct.

Which of the following do you think is the odd one out?

Example

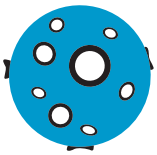
Wood

Paper

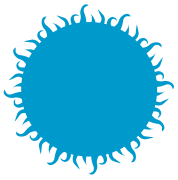
Rock

List your reasons		Because it is the only man-made thing.	It is the only thing that cannot be burnt.

Earth



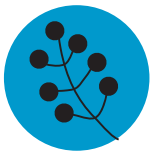
Moon



Sun

List your reasons			

Shell



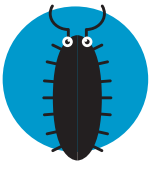
Plant

Rock

List your reasons			

Worm

Snake



Centipede

List your reasons			

BRITISH SCIENCE WEEK 2017

CHANGING COLOURS

NATURE'S COLOUR PALETTE

WITH THE EDEN PROJECT

Toolkit

- Thin white card
- Double-sided sticky tape

About this activity

Nature is full of a wonderful array of colours that change over the course of the year through the four seasons. From the green buds showing new life in Spring, the bright colours of Summer, the golden browns and rusty oranges in Autumn to the bleaker shades of Winter, our environment is constantly changing.

This simple outdoor activity involves collecting coloured items from the environment to create a colour palette, with options to extend the activity by writing poems and creating displays.

Watch out!

Ensure that you are aware of your safety when working outdoors and are supervised at all times. You must wash your hands thoroughly after this activity. Ensure your supervisor checks the area for broken glass, dog mess, plants with toxic seeds and plants that might cause irritation and make sure you avoid them.

Take a photo of your colourful creation and enter it into our poster competition.

eden project

Part 1

Create your colour palette

To make your colour palette, use a thin piece of white card, and stick some double-sided sticky tape on it.

Your task is to collect as wide a range of natural colours as you can find in a given area, sticking tiny bits of different colours to the palette. By looking closely, you will be able to find a surprising amount of colour – even in unpromising locations or at seemingly less colourful times of year.

How are you going to make your colour palette? Think about:

- Look at the edges, under and around the back of things
- Use both natural and unnatural objects
- Be considerate about limiting damage to plants by collecting only tiny bits

Part 2

Discuss the changing seasons

Think about which colours are easiest to collect, and why. Can you work out what the colours will be like at different times of the year?

Why do leaves change colour in Autumn, and why do they fall from the trees?

Part 3

Get creative

Now you've got an eye for the colours in your landscape, make use of your skills to create some landscape art. Why not try crafting a picture such as a face, house, or landscape scene out of the materials you found in the environment?

Create a poem using your colour palette as inspiration. Pick an eye-catching colour from your palette and write a short phrase describing it onto a post-it; using amazing adjectives, spot-on similes, magnificent metaphors (or whatever else you happen to be working on in literacy). Gather in a group with other students to share and combine your lines in order to create a collaborative colour poem. You could use big chalks to write your finished poem on the playground tarmac, or create a poster.

Next steps

For more information and lots more activities, have a look at the Eden Project website **edenproject.com/schools**

This activity links with our Rainbow Colour Collectors CREST Star activity **crestawards.org/project-resources**

BRITISH SCIENCE WEEK 2017

CHANGING COLOURS

CATCH A RAINBOW

Toolkit

- Washing up liquid
- Shallow bowl
- Different colours of food colouring

About this activity

Some very unusual interactions take place when you mix a little milk, food colouring, and a drop of washing up liquid. This artsy activity will help you discover the scientific secrets of soap and create a beautiful explosion of colours at the same time.

Watch out!

This experiment can get rather messy so ensure your workspace and clothes are well protected. Afterwards, make sure you wash the bowl thoroughly and wipe up any spills carefully.

Part 1

Get colourful

Pour a cup of milk into a shallow bowl and carefully put three drops of one colouring into one side. About a third of the way around put three drops of another food colouring and another third of the way around put three drops of a different food colouring. Do this very carefully, without moving the bowl, so that the three colours do not mix.

Next, squeeze a drop of washing up liquid into the centre of the bowl and record what you see. What happens to the colours?

Part 2

Mix it up

You could try repeating the experiment using water in place of milk. Observe whether you get the same eruption of colour or not.

You could also test out different types of milk (but never unpasteurised) and explore which percentage of fat produces the best swirling of colour? Semi-skimmed or full-fat – which is better?

Next steps

For more ideas of experimental science projects you can do, read about CREST **crestawards.org/crest-star**

Take a photo of your colourful creation and enter it into our poster competition.

BRITISH SCIENCE WEEK 2017

CHANGING COLOURS

FLOWERS TO DYE FOR

Toolkit

- White flowers
- Water
- Food colouring
- Vase

About this activity

This colourful activity demonstrates how plants absorb water through their roots and up their stems. Add a little food colouring to the vase in order to transform white flowers into different colours.

Watch out!

This experiment can get rather messy so ensure your workspace and clothes are well protected.

Take a photo of your colourful creation and enter it into our poster competition.

Part 1

Get colourful

Fill your vase with water and add a few drops of food colouring. Cut the bottom off the stems of your flowers and place them in the vase. Leave your flowers in the coloured water for a few hours and observe what happens.

It should take between 6 – 12 hours to get the best results, so perhaps check again at the end of the day.

Try splitting the stem of your flower in half and putting each half in water dyed a different colour. What do you think will happen?

Next steps

For more ideas of experimental science projects you can do, read about CREST **crestawards.org/crest-star**

Why not try this for Demo Day?

BRITISH SCIENCE WEEK 2017

CHANGING STATES

KITCHEN CHEMISTRY

WITH FOOD TEACHERS CENTRE

Toolkit

You'll need to measure and mix this set of ingredients five times to complete all five tests:

- 300g strong white flour
- 1/2 a tsp of salt
- 15g margarine
- 1 sachet quick acting yeast (7g)
- 200ml warm water
- Milk for glazing
- A different type of flour

Also: weighing scale, measuring jug, sieve, measuring spoons, mixing bowl, mixing spoon, timer, loaf tin, cooling rack

About this activity

Get your bake-on and try your hand at making some bread. Baking is often thought of as an exact science: with precise measurements, temperatures and timings resulting in a tasty transformation. But what do all the ingredients do? What happens if we change the recipe and a key ingredient is missed out?

Watch out!

Ensure health and safety precautions are taken when working with raw ingredients and a heated oven. Check for any food allergies prior to undertaking this activity. Do not do food-related experiments in school labs if you intend to eat the results. Ensure that appropriate hygiene and cleanliness precautions are in place.

Part 1
Get baking

Preheat the oven to 220 degrees Celsius before getting started and grease/line the baking tray.

Sieve the flour and salt into the mixing bowl and rub in the margarine. Stir in the yeast. Make a well in the middle of the flour, add the water, and mix until you form a soft dough.

Next, place the dough on a lightly floured work surface and knead for 10 minutes. Divide into 8 equal pieces and shape each piece into a roll. Brush bread rolls with a little milk, if desired.

Bake in the oven for 10-15 minutes until the rolls sound hollow when tapped on the base. Then remove them and allow the rolls to cool on a rack!

Part 2
Alter the recipe

Now experiment what happens when you change the recipe. Try to:

- Bake your rolls without the salt
- Bake your rolls without the yeast
- Bake your rolls without the margarine
- Bake rolls with a different type of flour – brown, plain, white, etc

Part 3
Sample your creations

Observe the differences in size, texture and appearance, and if you're allowed, also have a taste to see which is the best:

- How and why is each loaf of bread different?
- What might be the purpose of each ingredient in bread?

Next steps

If you liked trying out some kitchen chemistry, check out the Food Teachers Centre for a wide variety of resources **foodteacherscentre.co.uk**

Food Teachers Centre

BRITISH SCIENCE WEEK 2017

CHANGING STATES

ALKA-SELTZER ROCKET

WITH THE INSTITUTE OF PHYSICS

Toolkit

- 15g empty film canister
- Alka-seltzer tablet
- Water
- Coloured paper/card and decorating materials (optional)

About this activity

Turn simple household ingredients into an awesome rocket which can shoot up in the air.

Watch out!

You, and anyone watching, need to stand well back when your rocket launches.

WOW!

Why not try this for **Demo Day?**

Part 1
Make your rocket

Break the Alka-seltzer tablet in half and place half in the empty film canister. Add around 1cm depth of water and then fit the lid onto the canister, ensuring the seal is tight (otherwise you will only get a disappointing 'fizz').

Turn the canister upside-down and place it on a flat surface, stand back and wait for blast-off.

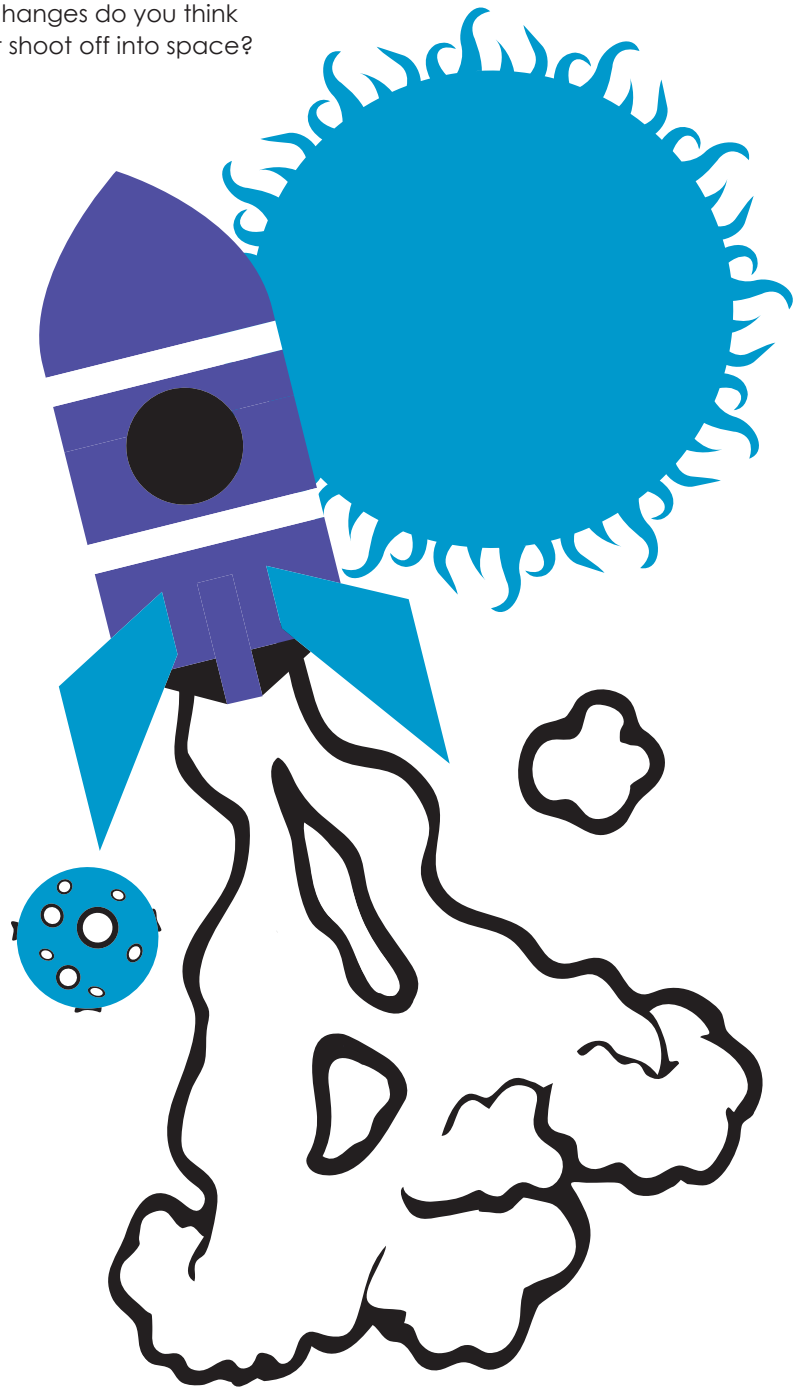
What chemical changes do you think makes the rocket shoot off into space?

Part 2
Get decorative

If you wanted to, you could decorate your rocket with coloured paper/card and colouring pens to make it look like a real rocket.

Next steps

Find more activities and resources on the Institute of Physics website **physics.org/discover**



IOP Institute of Physics

BRITISH SCIENCE WEEK 2017

CHANGING STATES

MAKING A RUBBER BALL

WITH THE WORSHIPFUL COMPANY OF HORNERS

Toolkit

- Rubber latex solution (can be sourced from craft shops like Hobbycraft or online)
- Lemon juice or vinegar
- Small container
- Tea spoon
- Vinyl protective gloves
- Eye protection
- Drying up cloth
- Bowl of cold water
- Sodium bicarbonate (optional)

About this activity

Natural rubber latex is the elastic hydrocarbon polymer liquid obtained from rubber trees. Synthetic rubber can also be made.

Change liquid rubber to a solid rubber ball, simply by adding an acid such as lemon juice or vinegar! Observe the chemical reaction that takes place, called cross linking, where individual chains in the liquid become linked to one another.

Watch out!

Rubber latex solution may cause a skin allergy for some people so avoid skin contact; eye protection and vinyl gloves should be worn when handling. Rubber latex solution contains a small amount of ammonia so do not sniff the solution. Once the rubber is solid it is unlikely that there will be an allergic response so the rubber ball can be handled normally.

WOW!

Why not try this for **Demo Day?**

Part 1

Make the rubber ball

Place a small amount of rubber latex solution in the small container and add a small amount of lemon juice or vinegar. Stir with a teaspoon until a solid rubber is formed. Next, place the solid rubber in the large bowl of water and mould it into a ball shape using your hands. Finally dry the ball using the cloth.

Part 2

Test the rubber ball

Put your rubber ball to the test and investigate its 'bounciness'. Measure by dropping the ball from different heights and see how far up it bounces. Why not try comparing your rubber ball to other material balls such as a ping pong ball, or tennis ball?

Part 3

Make a foam rubber ball

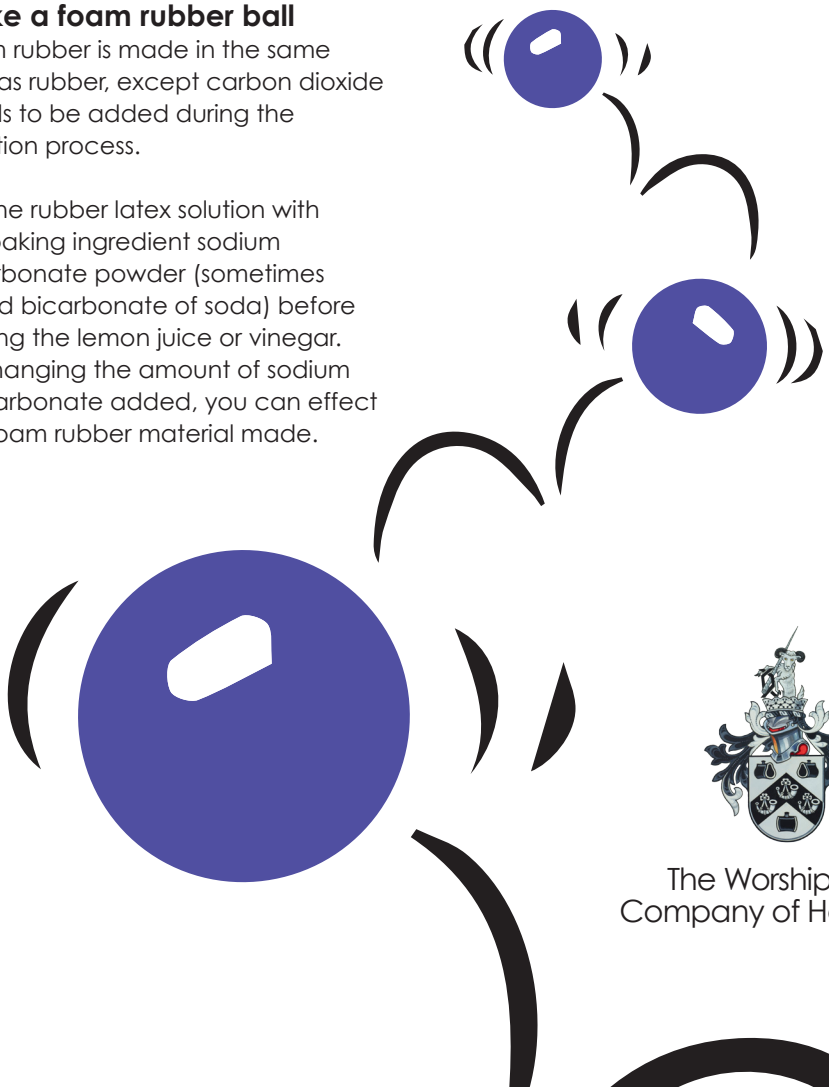
Foam rubber is made in the same way as rubber, except carbon dioxide needs to be added during the creation process.

Mix the rubber latex solution with the baking ingredient sodium bicarbonate powder (sometimes called bicarbonate of soda) before adding the lemon juice or vinegar. By changing the amount of sodium biocarbonate added, you can effect the foam rubber material made.

Next steps

Rubber bands can also be made from the same ingredients used to make the rubber ball. More information and tests that can be carried out on the rubber bands plus other polymer based activities can be found in Gatsby Science Enhancement Programme booklet "Fantastic Plastic" **stem.org.uk/elibrary/resource/27273**

This activity is based on the Fantastic Plastic booklet and acknowledges the Gatsby Science Enhancement Programme.



The Worshipful Company of Horners

BRITISH SCIENCE WEEK 2017

CHANGING STATES

SOLIDS, LIQUIDS, GASES

WITH THE ASSOCIATION OF SCIENCE EDUCATION

Toolkit

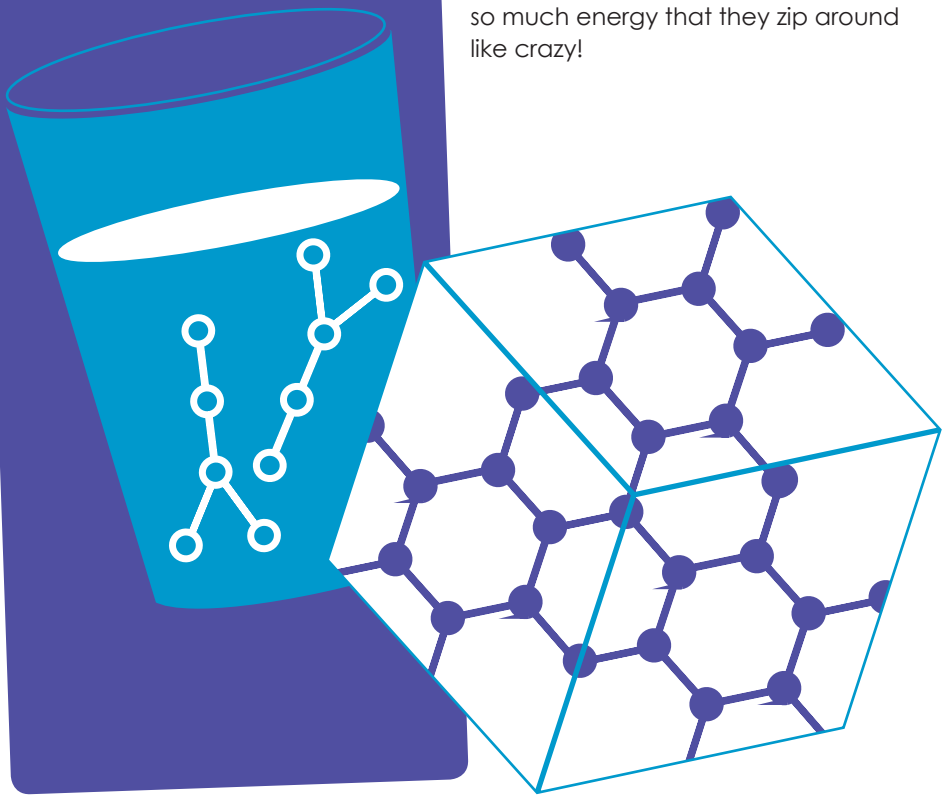
- Yourself and some friends/ classmates
- Some space to move around in (a classroom, hall, playground)

About this activity

This team-building activity will help you to understand and explain the structures of solids, liquids and gases, whilst getting creative and active.

Watch out!

Ensure that you are aware of your safety when working outdoors and are supervised at all times. Choose an area of open ground, a safe distance from roads or private property.



Part 1

Representing the states of matter

Imagine you and your fellow classmates are all molecules.

Consider how you might represent the different states of matter:

Solid
Freeze in place near one another, and try to link up/touch the person nearest to you. Like a table or a chair or a block of ice, solids don't look like they are moving on the outside. Molecules in a solid are rigid and still (at least, compared to those in a liquid or gas).

Liquid
Wave your arms in the air and walk slowly about, as if you are floating in a pool. Liquids, like water or juice or soup, flow.

Gas
Throw your arms about and wriggle and wobble and shake (without harming anyone close by) and run around gently bouncing off of one another. In a gas, the molecules have so much energy that they zip around like crazy!

Consider movements you might create to represent:

Evaporation
A liquid changing to a gas

Melting
A solid changing to a liquid

Freezing
A liquid changing to a solid

Condensation
A gas changing to a liquid

Part 2

Play a 'Solid, Liquid… Gas!' game

Play 'Solid, Liquid… Gas!', a game you might recognise as "Red Light, Yellow Light, Green Light". Solid is Red (freeze in place); Liquid is Yellow (walk); and Gas is Green (run).

You and your classmates must start in a line at one end of the hall/playground and a designated 'caller' will shout out prompts. The aim of the game is to all race to the finish line whilst following the prompts. Those who do not follow the prompt are sent back to the starting line.

To make the game trickier, start using different words. Instead of Solid, use "Table", "Basketball", "Train". Instead of Liquid, use "Lemonade", "Strawberry Milk", "Smoothie". Instead of Gas, use "Air inside a tyre" and "What you breathe". Slowly transition into more difficult prompts as the game progresses.

The first to the finish line becomes the new 'caller'.

Next steps

Find more resources on the Association of Science Education's resource bank **ase.org.uk/resources**

The Association for Science Education

BRITISH SCIENCE WEEK 2017

CHANGING ENVIRONMENT

EVOLUTION: CHANGING CAMOUFLAGE

WITH THE INLAND WATERWAYS ASSOCIATION

Toolkit

- 100 pieces of equal-length wool or string in 5 different colours - blue, green, brown, red and yellow (20 pieces of each colour)
- Tape measure
- 2 strips of double-sided tape
- Board/flip chart stand

About this activity

This activity aims to explain the importance of camouflage as part of animal and plant adaptation for survival in different environments and how adaptation may lead to evolution.

Watch out!

Ensure that you are aware of your safety when working outdoors and are supervised at all times. Choose an area of open ground, a safe distance from roads or private property, free from broken glass and not contaminated with dog mess.

Part 1
Preparations

Mark an outdoor area of 12m by 12m using the tape measure – this can be in a meadow, or woodland area or the school playing field. Have one person spread the 100 strands of coloured wool/string randomly over the marked out space. These pieces of wool/string are 'worms'.

Place two strips of double sided tape vertically about 30cm apart on the board or flip chart stand.

Part 2
Hunt for worms

Divide yourself into two teams and line up on either side of the board or flipchart. One at a time, pretend to be a bird and fly/run to the marked area and bring back the first worm you see on the ground. Return and stick the worm on the tape starting at the top and work down in order of collection.

Keep playing the game until everyone involved has returned with a worm and pause the game to analyse the results. Alternatively, get competitive where each team continues to take turns to search, as a race to see who collects most worms. After 5 minutes stop the game and analyse the results.

Part 3
Get analysing

Have a look at your results and think about the following questions:

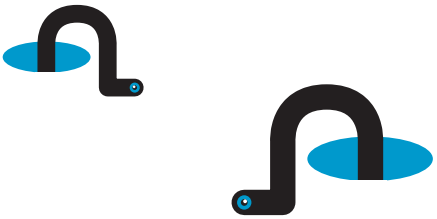
- Which colours have been collected?
- Which coloured worm has been collected the most? Why do you think this is?
- How many worms has each team collected?

Consider the impact of the worm's colour on evolution:

- Which colour worm has the best camouflage?
- What colour are the real worms you've seen?
- How might this protect them from predators?
- Could worms be any other colour and still survive?
- What colours might we see in other locations in the environment, e.g. a desert, a river etc?
- What animals do you know of with excellent camouflage?

Next steps

Find more activities on The Inland Waterways Association website **waterways.org.uk/wow**



This activity links with our Clever Camouflaged Creatures CREST Star activity **crestawards.org/project-resources**

The Inland Waterways Association

Keeping our waterways alive

BRITISH SCIENCE WEEK 2017

CHANGING ENVIRONMENT

CHANGING LIKE THE WIND

WITH THE ROYAL METEOROLOGICAL SOCIETY

Toolkit

- Bubble blowing kit
- Compass or compass app
- Measuring tape
- Watch or stopwatch

About this activity

Whether it's a gentle breeze or blowing a gale, explore how the wind changes using bubbles to measure both direction and speed.

Watch out!

Ensure that you are aware of your safety when working outdoors and are supervised at all times. Choose an area of open ground, a safe distance from roads or private property.

Part 1

Track the wind direction

Place a marker at your start location, and then blow some bubbles and pick one to follow. Chase your chosen bubble, without getting in its way, until it pops or floats somewhere you cannot follow.

Blow another bubble from where you end up and follow that one. Repeat this up to ten times if possible. Wherever you end up, look back at where you have come from.

Now use your compass to work out the direction back to the starting point. This will give you the average wind direction, because wind direction refers to where the wind is blowing from.

Part 2

Work out the wind speed

Assign someone to be a 'blower' and another as a 'timer'.

Place a marker at your start location and another marker 10 metres away (roughly ten paces), in the general direction the wind will carry the bubbles. This will be your bubble 'racecourse'.

Have the 'blower' blow some bubbles, and the 'timer' pick one to follow. The 'timer' uses the watch/stopwatch to measure how long it takes the bubble to reach the finishing line. By knowing the time it took to travel 10 meters, you can calculate the wind speed.

Speed = distance/time

Is the wind speed and direction the same everywhere, or can you find differences, for example as you move around a building?

Next steps

For more activities from the Royal Meteorological Society, take a look on their website **metlink.org**

RMetS
Royal Meteorological Society

BRITISH SCIENCE WEEK 2017

CHANGING ENVIRONMENT

MY 'MOON DIARY'

WITH BBC TERRIFIC SCIENTIFIC

Toolkit

- Pen/pencil
- Notebook

About this activity

Our Moon is beautiful and we've been staring at it for ages! It is said we know more about the surface of the Moon than we do about the depths of our oceans. But what if we can't see it? Can we see the same amount of the Moon every night?

This activity will show you how differently we see the Moon over time by keeping a diary, and help you come up with ideas as to why this is.

Watch out!

If you can't see the Moon from your house, you might need to go outside. Make sure you have a parent or guardian to go with you at all times if you do!

STARGAZING LIVE

Part 1

Start your 'Moon Diary'

To start your 'Moon Diary', write the date in your notebook and leave a space next to it for your drawing of the Moon.

Part 2

Look for the Moon

You might not be able to see the Moon every evening, depending on the day you start your diary. Why could this be? If it is very cloudy and you can see light from the Moon but not the shape it appears to be, don't worry! Write this down and try again tomorrow.

Part 3

Draw the Moon

Draw the Moon each night for a month. Consider whether the Moon looked the same yesterday as it did today? What about two weeks ago? Why do you think this could be?

If you cannot see the Moon, sketch the shape of the light coming from it, by drawing a circle and colouring it in, so the bits left blank are what you can see in the sky.

Part 4

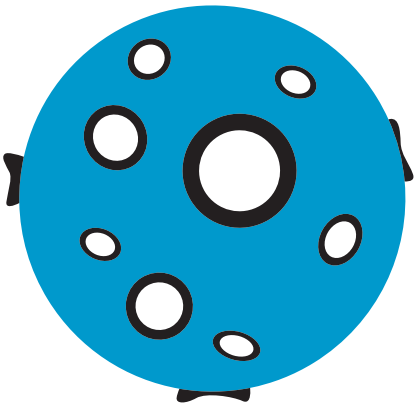
Learn how the Moon moves

Make sure you check out the BBC Terrific Scientific website to learn more about the Earth and how the Moon moves around it, go to **bbc.co.uk/terrificscientific**

Next steps

If you liked this activity, be sure to check out the BBC Terrific Scientific website **bbc.co.uk/terrificscientific/sections/terrific-stuff** where you'll find many more fun things to do!

This activity links to the Terrific Scientific Time Investigation, which your school can take part in. Make sure your teacher has signed up for this exciting mass investigation and find out more at **bbc.co.uk/terrificscientific/sections/teachers** or **bbc.co.uk/terrificscientific/sections/cymraeg**



BBC TERRIFIC SCIENTIFIC

BRITISH SCIENCE WEEK 2017

CHANGING ENVIRONMENT

MOVING SHADOWS

WITH BBC TERRIFIC SCIENTIFIC

Toolkit

- Chalk (jumbo outdoor chalk would be ideal, and water-soluble)
- A willing volunteer who can stand still for a minute or two
- Enough sunshine to cast a shadow!

About this activity

For thousands of years, we have been using the Sun to tell the time. Sundials cast shadows which could be used to tell what time it was during the day. But how do they work? And can anything be a sundial?

In this activity, you will become a human sundial! By looking at the shadows you cast during the day, you'll be able to see how helpful the Sun is in telling the time.

Watch out!

You'll need to go outside for this activity, so make sure you have a parent or guardian to go with you at all times. They can help you draw your shadow and you can do theirs too!

BBC TERRIFIC SCIENTIFIC

Part 1
What are shadows?

Think and discuss in groups about what you already know about shadows:

- What are shadows?
- When do you have a shadow?
- Can you pick up a shadow?
- Can your shadow become detached from you? If so, how?
- Can you ever have more than one shadow? How?

Part 2
Head outside

Go outside with your friend/parent/guardian and look for a concrete floor which gets lots of sunshine. Ideal places to use are your school playground, the closest park and areas away from tall buildings, fences and trees that would block the sunlight from reaching the ground.

With your chalk, draw an 'x' on the ground where you, the human sundial, are going to stand, and mark the direction you are facing on the ground also. Ask your friend/parent/guardian to use the chalk to draw around the shadow you are casting. You can then swap places and draw around their shadow too!

Come back to the same spot every hour or so, face the same direction and draw your shadows again. Repeat as many times over the course of the day as you'd like.

Part 3
Examine your human sundial

At the end of the day, go and look at your human sundial. What do you notice about your shadows? Are they in the same place now as they were when you first drew them? Are they the same size? What's changed?

Consider the whole Earth, and whether the same pattern of shadows would be seen everywhere else in the world? How does the rotation of the Earth affect sunlight across the world?

Part 4
Learn how the Earth moves around the Sun

Make sure you check out the BBC Terrific Scientific website to learn more about the Earth and how it moves around the Sun at **bbc.co.uk/terrificscientific**

Next steps

If you liked this activity, be sure to check out the BBC Terrific Scientific website **bbc.co.uk/terrificscientific/sections/terrific-stuff** where you'll find many more fun things to do!

This activity links to the Terrific Scientific Time Investigation, which your school can take part in. Make sure your teacher has signed up for this exciting mass investigation and find out more at **bbc.co.uk/terrificscientific/sections/teachers** or **bbc.co.uk/terrificscientific/sections/cymraeg.**

BRITISH SCIENCE WEEK 2017

CHANGING MATERIALS

MONEY MONEY MONEY

WITH THE WORSHIPFUL COMPANY OF HORNERS

Toolkit

- A plastic five pound note
- A variety of different types of plastic bags
- A variety of different types of paper
- Scissors
- Hanging masses
- Retort stand and clamp
- Hole punch
- Bowls
- Warm and cold water
- Safe washing detergent
- Paper and felt tip/permanent marker pens
- Vinyl gloves and eye protection
- Washing line and pegs

About this activity

On 13 September 2016, the UK issued its first plastic bank note; it is claimed that these notes are cleaner and more longer-lasting than their paper alternatives. This activity will investigate these claims, and examine the changes to the materials used!

Watch out!

Take care in cutting the plastic and paper strips, and ensure you have suitable supervision.

Take caution to any allergies to the ingredients within the washing detergent, and avoid skin contact. Eye protection and vinyl gloves should be worn when using the detergent.

Part 1

Strength test

Did you know? In 2015, 10,761 notes were replaced because they had torn and 5,364 because they'd been chewed!

Cut a variety of plastic bags and a variety of paper into strips (approximately 5 x 10cm). Punch a hole in both ends of each plastic and paper strip, always in the same position to ensure it is a fair test!

Set up a retort stand, and g-clamp it to the desk. The stand should have a clamp attached too (if you do not have a retort stand, a suitable hook in the ceiling or wall will work).

In turn, place each test strip on the end of the clamp. Add hanging masses on the bottom of the strip, one at a time, until the strip breaks.

Record the mass at which each strip breaks, and assess the strength of the varieties of paper and plastic. Which is the strongest?

Part 2

Washing machine

Did you know? In 2015, 1801 notes were replaced because they had been accidentally washed.

Cut some paper strips (approximately 5 x 10 cm) and design your own five pound note using permanent and/or washable markers!

Fill a bowl with lukewarm water and add a teaspoon of detergent. Submerge your five pound paper notes in the water and let them soak.

Try moving them around in the water but avoid twisting or scrubbing them. Next, empty the bowl and refill it with cold water. Rinse all the paper notes and then hang them up to dry.

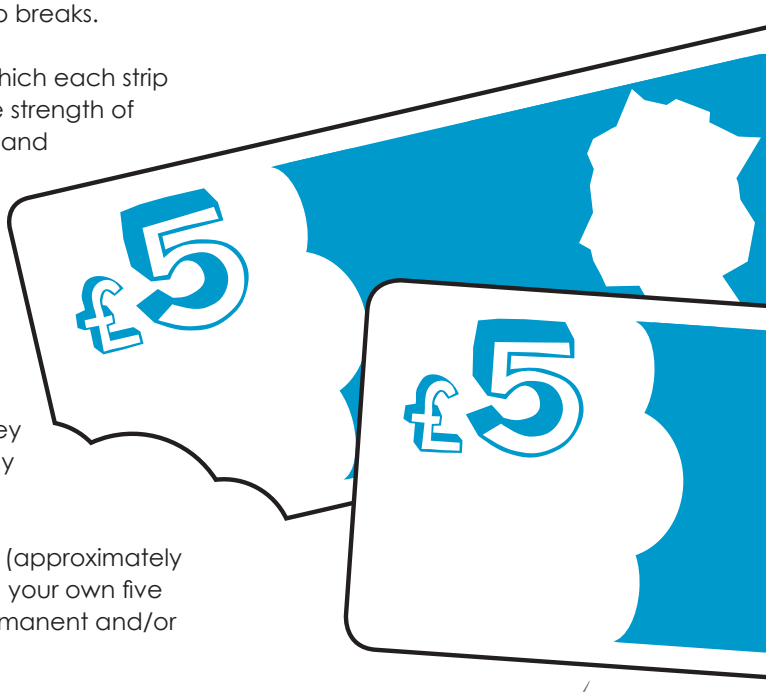
Repeat the same experiment but with the plastic five pound note.

Once all the notes are dry, see what has happened to each of your paper notes, and compare this to the plastic five pound note. Consider:

- Have any of them faded?
- Have any of them fallen apart?

Next steps

For more information visit **thenewfiver.co.uk**



The Worshipful Company of Horners

BRITISH SCIENCE WEEK 2017

CHANGING MATERIALS

BOOGIE GLOOP

INSPIRED BY ROALD DAHL'S GEORGE'S MARVELLOUS MEDICINE

Toolkit

- Cornflour
- Water
- A mixing bowl
- A subwoofer music speaker
- A thin metal baking tray
- Food colouring (optional)

About this activity

Have you read 'George's Marvellous Medicine' by Roald Dahl? It's a story about a very inventive boy who one day cooks up a marvellous medicine which has some magical results... The only way to be an inventor like George is to throw in EVERYTHING and see what happens. It's so much more fun that way too... Here's how you can make your own glorious gloop and see invisible sound waves in action. It's messy, it's fun – it's two experiments in one!

If you stir the mixture slowly, it stays liquid-like. This is because the water can flow between the cornflour grains fairly easily. Stir it quickly though, and the grains have no room to move, so they get stuck together, turning the mixture thick, clumpy and almost solid.

Watch out!

When you've finished, do not pour the boogie gloop down the sink as this could clog the pipes. Instead, spoon the mixture into a zip-lock bag, fasten it tightly and dispose of it in a bin.

Part 1

Make your boogie gloop

Mix two cups of cornflour with half a cup of water in a mixing bowl. Add more water until your gloop is thick and... well, gloopy.

Lie the music speaker on its back and place the metal tray over the part where the sound comes out. Pour your gloop on to the tray. Add some spots of food colouring if you like.

Press lightly on one corner of the tray to hold it steady. Play music through the speaker – the louder, the better.

Your gloop should start to jiggle and dance on the tray. If it doesn't, try a different song, change the volume, or adjust the pressure you're putting on the tray.

Part 2

Experiment

What makes the gloop dance more – low frequencies or high frequencies?

Why not try changing the mixture? Does thicker gloop dance better than thinner gloop?

Next steps

If George has inspired you, share your experiment with **@Roald_Dahl** on Twitter and Facebook **#MarvellousScience**

You can find even more marvellous experiments inside the new George's Marvellous Experiments book, released February 2017!

Plus there's a free wondercrump doorhanger inside the 2017 edition of George's Marvellous Medicine – perfect for young inventors everywhere!

BRITISH SCIENCE WEEK 2017

CHANGING MATERIALS

POP A BALLOON

INSPIRED BY ROALD DAHL'S GEORGE'S MARVELLOUS MEDICINE

Toolkit

- A bottle of fizzy drink
- A packet of popping candy
- A balloon
- A small funnel (you can always make your own using card)

About this activity

George's medicine makes his granny grow through the roof – and that's just the start... if only blowing up balloons was that easy! Don't worry though – science has a solution that'll save your aching lungs!

Watch out!

Be careful that no one is allergic to balloons before you get started. This experiment can get rather messy so ensure your workspace and clothes are well protected.

Part 1
Make your boogie gloop

Pour the popping candy into your uninflated balloons. This is where the funnel comes in handy.

Take the lid off your fizzy drink bottle and stretch the hole of the balloon over the top of the bottle, making sure none of the popping candy falls into the liquid. The balloon needs to be securely attached (this is a bit fiddly, so you may need help).

Part 2
Pop the balloon

Tip the balloon up so the popping candy falls into the drink. The balloon will inflate before your very eyes, without you having to huff or puff even once!

Part 3
Experiment

What happens if you use a different sized bottle, or a different type of fizzy drink? Try different amounts of the popping candy mixture to see how big you can get the balloon.

Next steps

If George has inspired you, share your experiment with **@Roald_Dahl** on Twitter and Facebook **#MarvellousScience**

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BRITISH SCIENCE WEEK 2017

CHALLENGES

PENGUIN WATCH: CITIZEN SCIENCE

WITH ZOONIVERSE AND PENGUIN LIFELINES

Toolkit

- A computer/laptop or mobile/tablet
- Internet access
- A keen eye

About this activity

Climate change is having many negative effects around the world, and one area feeling it more than others is the cold icy region of Antarctica. Many wonderful wildlife species are in decline from changes to their food supply and habitat, and there is a huge gap in our understanding of the Antarctic ecosystem. As a result, Penguin Lifelines has teamed up with citizen science organisation Zooniverse to help measure changes to penguin populations.

Penguin Watch is a citizen science website that is trying to understand the lives of penguins. To do this, scientists have travelled to some of the coldest areas on the planet to learn more about penguin populations. However, they need your help to examine hundreds of thousands of images of wildlife in Antarctica and the Southern Ocean that have been taken over the past three years. Get involved and be a part of the conservation effort!

Part 1
Get online

Head to **penguinwatch.org** register an account and log-in.

If you want your school to sign up, and you want to adopt a specific colony, register as normal and then contact the organisation.

Part 2
Pick out a penguin

This online activity involves you individually marking adult penguins, chicks, and eggs in the image presented to you on the screen.

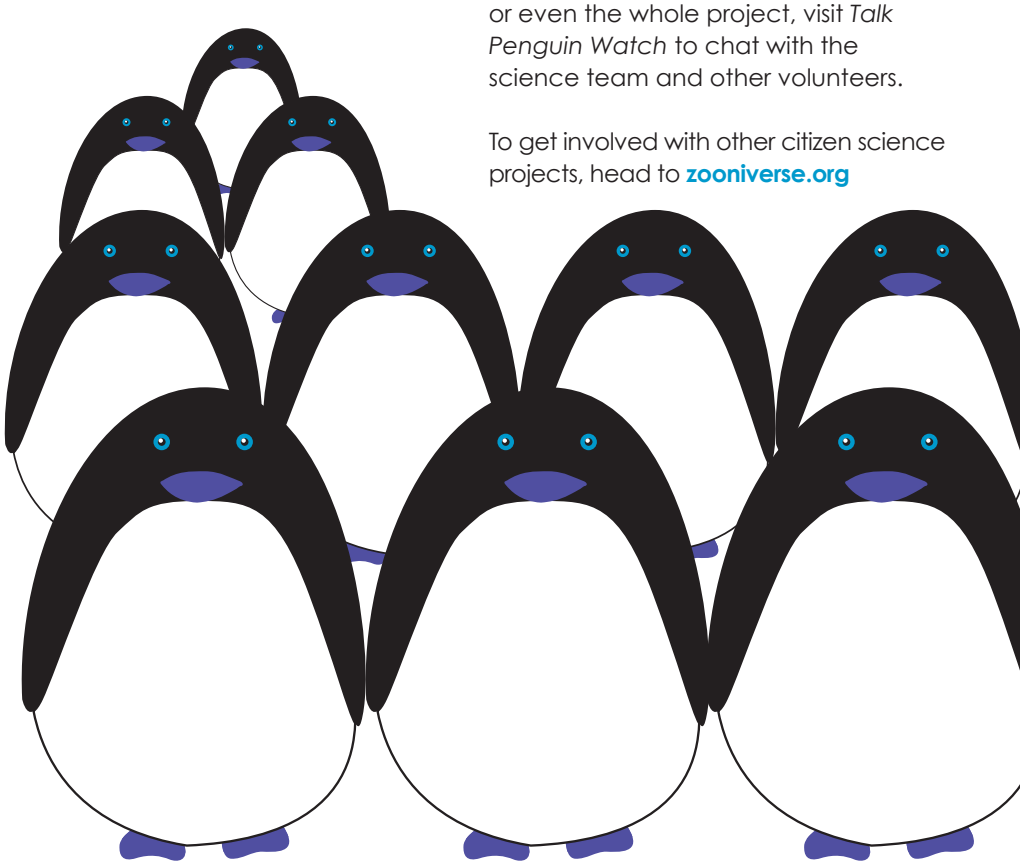
How does it work?

- Choose whether an individual is an 'adult', 'chick', 'egg' or 'other', then click and drag the marker to its centre
- Remove any accidental marks using the black-and-white cross
- If the penguins are too small to count or too far in the background, don't worry, simply mark any in the foreground and then click "Too many penguins to mark"
- Bad weather? Just click "I can't tell"
- Partially obscured? Click as many penguins as you can
- Mark any other animals you see in the image too, so the scientists can see how often they are found near the penguins' nests

Next steps

If after picking out your penguins, you want to discuss a specific image or even the whole project, visit *Talk Penguin Watch* to chat with the science team and other volunteers.

To get involved with other citizen science projects, head to **zooniverse.org**



ZOONIVERSE

BRITISH SCIENCE WEEK 2017

CHALLENGES

POSTER COMPETITION

Toolkit

- Paper (A4 or A3)
- Creative materials such as pens, pencils, scissors, glue, watercolours, paint, colouring crayons, glitter, pipe cleaners, felt, thread, wool, foil, clay, straws, string, beads, stamps, googly eyes, foam, sequins, pom poms

About this activity

Get creative and enter the British Science Association's annual poster competition. You can make your poster about whatever type of change you like, and enter into our UK-wide competition with the chance to win an array of prizes, including a copy of the new Roald Dahl's 'George's Marvellous Experiments' book!

Many activities found in this pack could also be entered into the poster competition, simply look for the paintbrush symbol above. Or you can use them to serve as a source of inspiration to get you started.

Part 1
Research your poster

Investigate or imagine the different types of changes occurring in science and the natural world around you. Choose a topic for your poster and do some research around the idea:

- What different types of change can we examine in nature?
- Carry out a science experiment and investigate the changes.
- How has our world changed over the years?
- Think about how you might change the world in the future.

Part 2
Make your poster

Once you've done your research, it's time to get creative!

Your poster must be:

- 2D (flat) – if you make a model, you need to just send us a photo of it
- On A4 or A3 paper

You can use pop up pictures, pull out tabs or use materials such as paint, drawing pencils, crayons and paper.

Part 3
Send us your poster

Posters will be judged on how creative and well-researched the ideas are and how well the poster has been made or drawn.

Once your poster is complete, write all your information on the back, have your teacher, leader or parent/guardian fill in the online registration form, and then post your entry to us.

Next steps

Celebrate! Whether you win a prize or not, you can join **makewav.es/britishscienceweek** for free, and upload a picture of your poster to get a special BSW2017 digital badge.

For more details, along with the full set of rules and tips for educators, check out our website **britishscienceweek.org/plan-your-activities/poster-competition/**

BRITISH SCIENCE WEEK 2017

CHALLENGES

TEDDY BEAR TECHNICIANS

PHOTO COMPETITION
WITH THE TECHNICIANS MAKE IT HAPPEN CAMPAIGN

Toolkit

- Camera or camera phone
- Props for dressing up and creating a scene

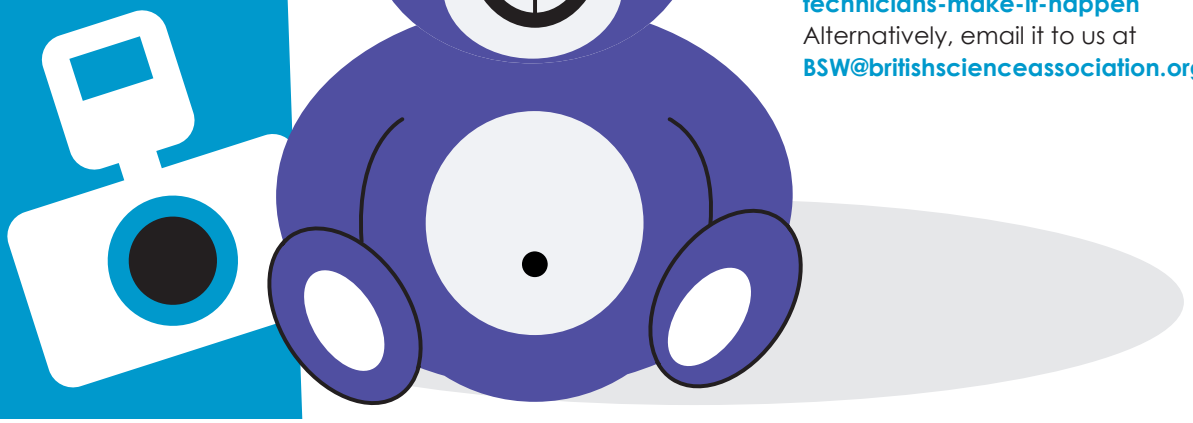
About this activity

We need your help to bring technicians into the spotlight! We're inviting young people, aged 5 -19 years, to use their imagination and creativity in this hands-on photo competition.

Share an image of a representation of a technician on Twitter to be in with a chance of winning a camera, practical kit for your school and an invitation to attend the British Science Association's 'Great British Science Club' celebration event in July 2017.

Watch out!

You will need to submit your entry via Twitter or email.



Part 1
Choose your 'technician'

Look around you and find something that technicians will have helped to make. There are different types of technicians and not all of them wear traditional white lab coats. They model car engines, they design the lighting for concerts, they build film production sets, and of course many do research. But what is it really like to be a technician and what do they do day-to-day?

Why not do an internet search starting with the Technicians Make it Happen website **technicians.org.uk**, or ask your teachers about the different kinds of work that technicians do? What is it about their job that excites you? You could act out the scene by dressing up a teddy bear, teacher or a parent as your technician of choice, or create your technician using modelling materials.

Part 2
Plan your photo

The scene around your 'technician' needs to convey the type of job they do. You can use everyday materials that you would find in your kitchen, equipment in your classroom, and any backdrops that you make yourself.

Remember, the photo should capture your 'technician' in their work-setting, clearly conveying their job. Be creative - the scene can be as elaborate as you want, including different aspects of the technician's career.

Part 3
Snap and share!

Next snap it – use a camera or a phone to take a picture of your scene with 'Technicians Make it Happen' somewhere in the pic – it can be a sticker, post-it note, chalkboard – whatever you fancy. Finally, to enter, post it on Twitter using **#TMiHPhotoComp**. Don't forget you can follow us **@BritSciAssoc** for ideas! Alternatively, email it to us at **BSW@britishscienceassociation.org**

Next steps

For more details, including competition rules, visit **britishscienceweek.org/technicians-make-it-happen**
Alternatively, email it to us at **BSW@britishscienceassociation.org**

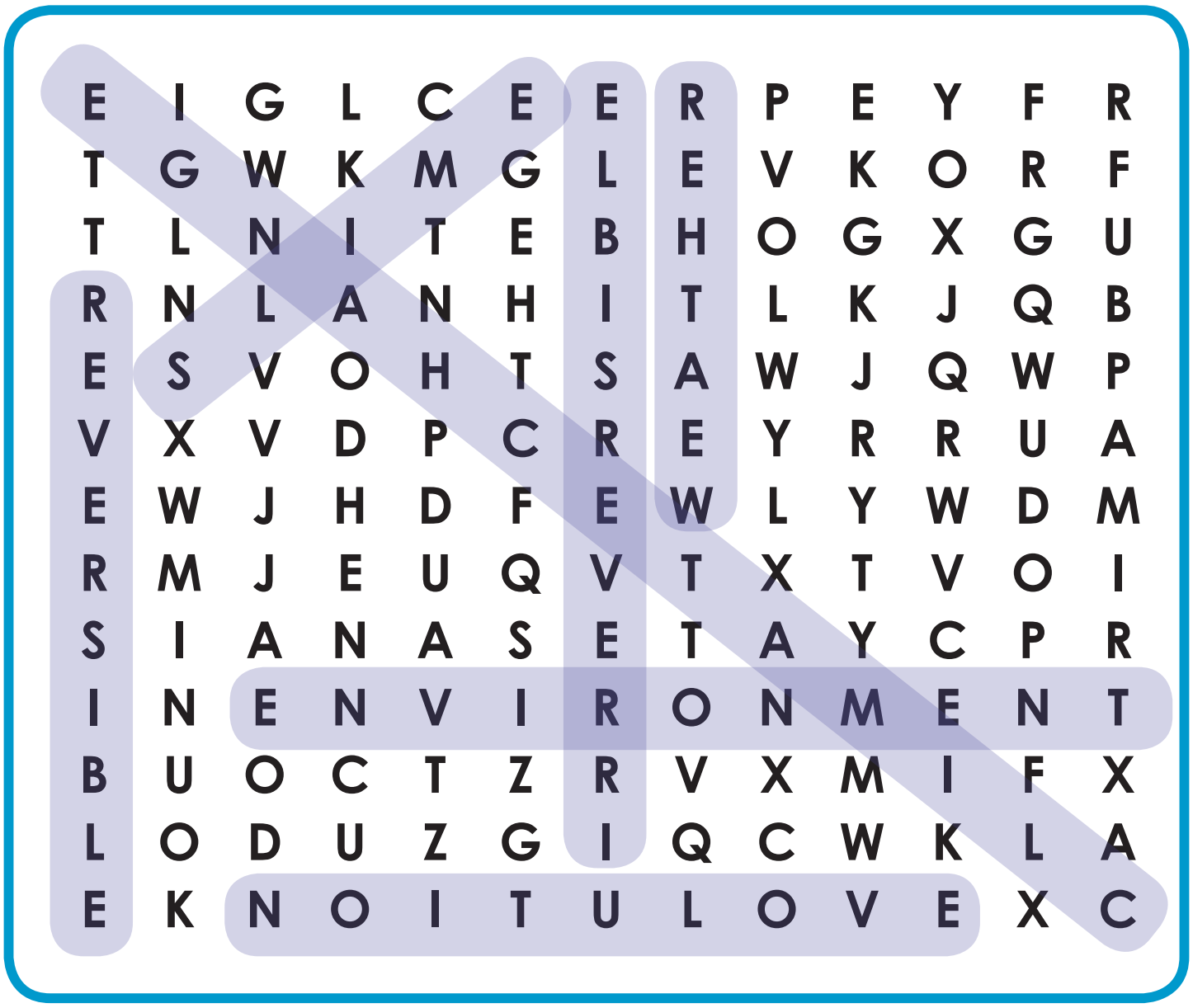
Technicians make it happen

GATSBY The encouragement and promotion of vital STEM technician roles in the UK is supported by The Gatsby Charitable Foundation. Find out more at: gatsby.org.uk

BRITISH SCIENCE WEEK 2017

CHALLENGES

ANSWER SHEET

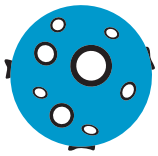
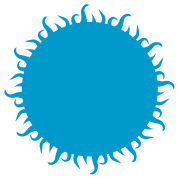


Species of penguin	Rockhopper	Humboldt	Emperor	Gentoo
Natural disasters	Earthquake	Drought	Eruption	Flooding
Seasons	Spring	Summer	Autumn	Winter
Famous scientists	Einstein	Newton	Darwin	Hawking

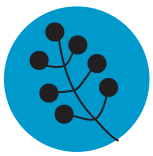
BRITISH SCIENCE WEEK 2017

CHALLENGES

ANSWER SHEET

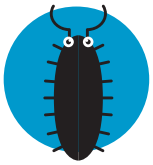




List your reasons	Known to have life	Is significantly smaller	Star/ball of gas


List your reasons	Was part of an animal	Living	Has never been alive





List your reasons	Lives underground	Not an invertebrate	Has legs/appendages

British Science Week
10 - 19 March 2017
www.britishscienceweek.org