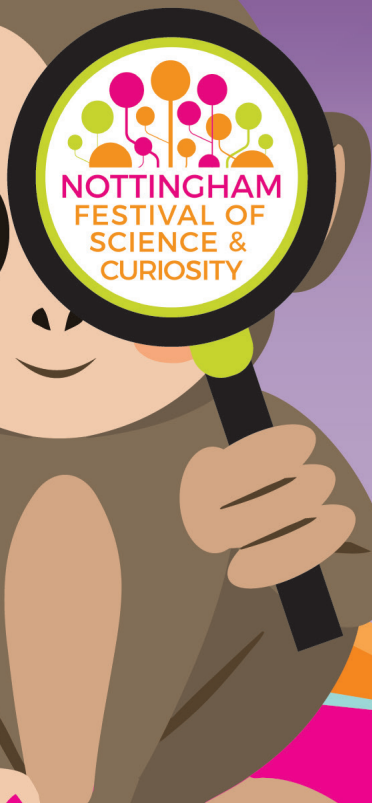




# FESTIVAL MAGAZINE

AND EVENT LISTINGS



[www.nottsfosac.co.uk](http://www.nottsfosac.co.uk)  
5th-16th February 2024



## Welcome to the Nottingham Festival of Science and Curiosity 2024!

We are delighted that, for the ninth year, the Festival of Science and Curiosity will be bringing science out from behind closed doors and into our everyday lives. Each year the festival invites the people of Nottinghamshire to explore, experiment and examine; to be curious, to ask questions, and to seek answers about the world around us, and this year is no different!

From 5th-16th February 2024, we will again be showcasing science in all its forms and celebrating curiosity in venues across Nottinghamshire. Focusing firstly on exciting experiments and sharing world-leading research in schools and colleges, we'll then open up the festival to the public with plenty of family-friendly events and workshops over half-term.

This year, our growing schools programme, running from 5th-9th February, includes: researchers delivering STEM activities at schools; the annual Real Science in Schools Symposium at the Council House; schools visits to the University of Nottingham School of Pharmacy; science-themed Curious Tots sessions; an interactive performance by UKAEA; and the Secret Science Show at Wollaton Hall.

In addition to this, our public programme spans every corner of the county, and is packed with lots of exciting chances to engage with science in unusual and wondrous ways. Families can drop into our daily Science Fun Days and get involved in a wide range of hands-on activities and demonstrations such as paper-making, 3D printing, brain functions, and chemistry experiments. You can also book on to join one of our free workshops for a more in-depth and interactive experience where you can explore everything from microscopes to molecules to mind reading!

And, of course, here we have the FOSAC Magazine, filled with articles, puzzles, and activities, written by real-life scientists and researchers. Flick through to find out more about dinosaurs with feathers, building control superheroes and sea-dwelling creepy crawlies to name just a few examples!

We hope that through the festival this year, you find something that makes you curious to find out more about it, and that you enjoy exploring the endless possibilities of science.

**For more information about the Festival,  
visit [www.nottsfosac.co.uk](http://www.nottsfosac.co.uk) or follow us on social media  
@NottsFOSAC.**




# EVENTS

All events are free to attend, unless otherwise stated.




All information correct at the time of print.

For further information, accessibility and booking, please visit:  
[www.nottsfosac.co.uk](http://www.nottsfosac.co.uk)

## Saturday 10th February

Science Fun Day Nottingham Central Library	Drop-In 	10AM - 2PM	Come along and join in some fun, hands-on experiments and activities in your local library. <b>Suitable for all ages</b>
Entangled Enigmas Workshop Bilsthorpe Library	Book 	10AM & 11AM	Prepare for an extraordinary mathematical journey where ropes, slime, and topology converge in our workshop, "Entangled Enigmas." Ages 5+.
Secret Science Show Wollaton Hall	Drop-In 	10:30AM - 3:30PM	Free entry to the Natural History Museum plus science-themed demonstrations in the Great Hall and talks in the Education spaces.








## Sunday 11th February

The Big Maths Gameshow with Kyle D Evans Broadway Cinema	Book 	1PM	A chance for you to battle against other audience members in five different rounds of mathematical games, leading to the crowning of one ultimate champion. Ages 7+.
Science Fun Day The Lenton Centre	Book 	10AM - 11.30AM & 12PM - 3PM	Come along and join in some fun, hands-on science activities at The Lenton Centre. The morning session is for children aged 5-9 years old, the afternoon session is for children aged 10-15 years old.
Lego Club Sidedoor Studio	Drop-In 	12PM - 5PM	Construct towering masterpieces, sleek automobiles, moon caves, or whatever your creativity desires! Suitable for all ages.




## Monday 12th February

Science Fun Day Clifton Library	Drop-In 	10AM - 2PM	Come along and join in some fun, hands-on experiments and activities in your local library. Suitable for all ages.
Planetarium Shows Mansfield Central Library	Book 	10AM, 11AM, 1PM & 2PM	Join researchers from Nottingham Trent University's Observatory for a journey into their inflatable digital planetarium. Ages 5+.

# EVENTS

Science Fun Day <b>Southwell Minster</b>	<b>Drop-In</b> 	10:30AM - 3PM	Come along and join in some fun, hands-on experiments and activities. Suitable for all ages.
Entangled Enigmas Workshop <b>Harworth &amp; Bircotes Library</b>	<b>Book</b> 	10AM & 11AM	Prepare for an extraordinary mathematical journey where ropes, slime, and topology converge in our workshop, "Entangled Enigmas." Ages 5+.
Bath-bomb making workshop with Lush <b>Mapperley Library</b>	<b>Book</b> 	11AM, 11:30AM, 12PM, 12:30PM, 1PM, 1:30PM	Join the Lush team to get creative and make your own bath bombs. Suitable for all ages.
Colourful Chemistry - Into A World of Surprises <b>Southwell Minster</b>	<b>Book</b> 	11AM & 1PM	Dive into hands-on experiments using everyday household items to unravel the secrets of pH, states of matter, density and much more, making fundamental chemistry concepts come alive in a vibrant, practical way. Ages 7+.
Maker {Futures} Workshops <b>Bassetlaw Museum</b>	<b>Drop-In</b> 	10AM - 12PM & 1PM - 2PM	A creative and playful electronics learning activity from the University of Sheffield to explore the process of creating, tinkering, testing and modifying. Ages 5+.
Habitat Nature Walk <b>Bennerley Viaduct</b>	<b>Book</b> 	2PM	Join us on a fun interactive tour for families to explore above and below Bennerley Viaduct. Ages 5-12.
The Mindreader vs. The Machine <b>Broadway Cinema</b>	<b>Book</b> 	1PM	During this performance, fMRI technology will be pitted against a mind reader - the ultimate matchup between science and magic! Ages 13+.

## Tuesday 13th February

Science Fun Day <b>Hyson Green Library</b>	<b>Drop-In</b> 	10AM - 2PM	Come along and join in some fun, hands-on experiments and activities in your local library. Suitable for all ages.
Stop-Motion Workshops <b>Kirkby-in-Ashfield Library</b>	<b>Book</b> 	10AM & 11:30AM	Come and learn how to make your own Stop Motion Animations! Ages 7+.
Habitat Nature Walk <b>Bennerley Viaduct</b>	<b>Book</b> 	10:30AM & 2PM	Join us on a fun interactive tour for families to explore above and below Bennerley Viaduct. Ages 5-12.




# EVENTS

Science Busking Workshops <b>Langold Library</b>	<b>Book</b> 	2PM & 3PM	Come and have a go with some weird and wacky science experiments made from household objects that make you go 'oooh!'. Ages 5+..
Science Fun Day <b>The Bridge Skills Hub, Worksop</b>	<b>Drop-In</b> 	11AM - 3PM	Explore a range of hands-on experiments & activities given by local employers and training providers, including construction, VR and engineering. Suitable for all ages.
Inflatable Planetarium <b>The Bridge Skills Hub, Worksop</b>	<b>Book</b> 	11AM, 12AM, 2PM, 3PM	Crawl into the darkened ExplorerDome and discover the worlds that glitter in our night sky. Ages 5+.
'Star Makers' Film Screening <b>The Bridge Skills Hub, Worksop</b>	<b>Book</b> 	4PM & 7PM	Bassetlaw residents are invited to watch a film and meet the cast of fantastic fusion energy scientists and engineers aiming to recreate a star here on Earth. Ages 9+.
Veolia Recycling and Crafts <b>Bassetlaw Museum</b>	<b>Drop-In</b> 	10AM - 12PM & 1PM - 3PM	What happens to our waste? Find out about the science of recycling and find out what you can upcycle from things that we throw away every day! Make a recycled craft to take home. Suitable for all ages.








## Wednesday 14th February

Science Fun Day <b>Strelley Road Library</b>	<b>Drop-In</b> 	10AM - 2PM	Come along and join in some fun, hands-on experiments and activities in your local library. Suitable for all ages.
Colourful Chemistry - Into A World of Surprises <b>Arnold Library</b>	<b>Book</b> 	10:30AM & 12PM	Dive into hands-on experiments using everyday household items to unravel the secrets of pH, states of matter, density and much more, making fundamental chemistry concepts come alive in a vibrant, practical way. Ages 7+.
Trelleborg Workshops <b>Bassetlaw Museum</b>	<b>Drop-In</b> 	10AM & 1PM	Meet with scientists from Trelleborg, an international polymer company, and take part in a creative activity. Ages 5+.
The Wonderful World of Paper <b>Toton Library</b>	<b>Book</b> 	11AM & 2:30PM	Join University of Nottingham scientist and researcher Dr Pearl Agyakwa to explore the wonderful world of paper through creative activities. Ages 7+.

# EVENTS

Puzzles and Games <b>Woodthorpe Library</b>	<b>Book</b> 	3PM & 4PM	Join us for an unforgettable journey where tangrams, Rubik's cubes, escapology puzzles, board games, and dissection puzzles converge to create an experience that will challenge and captivate all. Ages 7+.
Wind Turbine Workshop <b>DH Lawrence Birthplace Museum</b>	<b>Book</b> 	10AM, 11AM, 1PM, 2PM, 3PM	Build your own wind turbine to power a light or raise a lift in this workshop exploring the future of energy. Ages 7+.
Egg Drop Challenge <b>Bennerley Viaduct</b>	<b>Book</b> 	11AM - 3PM	Bennerley Viaduct stands 20 metres above the beautiful Erewash Valley. But would an egg survive the drop? Only one way to find out! Ages 7+.

## Thursday 15th February

Science Fun Day <b>St Ann's Valley Library</b>	<b>Drop-In</b> 	10AM - 2PM	Come along and join in some fun, hands-on experiments and activities in your local library. Suitable for all ages.
Science Fun Day <b>Nottingham Cathedral</b>	<b>Drop-In</b> 	10AM - 3PM	Come along and join in some fun, hands-on experiments and activities. Suitable for all ages.
Marble Maths <b>Mansfield Woodhouse Library</b>	<b>Book</b> 	10AM & 11AM	Embark on a mathematical adventure with our engaging workshops designed to introduce young minds to the fascinating world of algebra! Ages 7+.
Emotion Explorers: A Journey into the Brain's Wonderland <b>Blidworth Library</b>	<b>Book</b> 	10AM & 11AM	A short children-friendly introduction to the brain and how different neurotransmitters are related to different emotions (happiness – serotonin, reward – dopamine, stress – cortisol, fear – adrenaline). Ages 7+.
Experiment with Colour <b>Bassetlaw Museum</b>	<b>Drop-In</b> 	10AM & 1PM	Find out how colours mix and spread using chromatology and have a go at Tie Dye! All ages.
Habitat Nature Walk <b>Bennerley Viaduct</b>	<b>Book</b> 	10:30AM & 3PM	Join us on a fun interactive tour for families to explore above and below Bennerley Viaduct. Ages 5-12.
The Chemistry of the Paintbox <b>Lakeside Arts - Visual Arts Studio</b>	<b>Book</b> 	10AM - 11:30AM	Learn about where art materials come from, the chemical compounds they contain, and how artists' materials have changed over time with industrial and technological advances. Ages 8-12.

# EVENTS

Making Pigments from Plants <b>Lakeside Arts - Visual Arts Studio</b>	<b>Book</b> £8	1:30PM - 3PM	Make pigments from a range of plant-based sources and use them to create an artwork of your own. Ages 7-10.
Colourful Chemistry - Into A World of Surprises <b>Burton Joyce Library</b>	<b>Book</b>	2:15PM & 3:45PM	Dive into hands-on experiments using everyday household items to unravel the secrets of pH, states of matter, density and many more concepts, making fundamental chemistry concepts come alive in a vibrant, practical way. Ages 7+.

## Friday 16th February

Science Fun Day <b>Bulwell Riverside Library</b>	<b>Drop-In</b> ●	10AM - 2PM	Come along and join in some fun, hands-on experiments and activities at your local library. Suitable for all ages.
Magnets Workshop <b>Worksop Library</b>	<b>Book</b> 📖	9:30AM, 10:30AM, 11:30AM, 1:30PM, 2:30PM, 3:30PM	Work with magnets and batteries to create small electromagnets which mimic the large powerful electromagnets that UKAEA use in fusion energy machines. Ages 7+.
Antimicrobial Resistance Workshop <b>Retford Library</b>	<b>Book</b> 📖	10AM, 12PM, 2:30PM	Work with researchers from the University of Leeds in a fun, hands-on workshop all about antibodies. Ages 7+.
Eureka! Workshops <b>Stapleford Library</b>	<b>Book</b> 📖	10AM & 11AM	Join Maths Blast and dive into the world of statistics and scientific questioning through experiments and interactive activities. Ages 7+.
Science Fun Day (SEN/D) <b>Nottingham Cathedral</b>	<b>Drop-In</b> ●	10AM - 3PM	Come along and join in some fun, hands-on experiments and activities. Suitable for all ages. Event tailored for children with special educational needs and disabilities.
Habitat Nature Walk <b>Bennerley Viaduct</b>	<b>Book</b> 📖	10:30AM	Join us on a fun interactive tour for families to explore above and below Bennerley Viaduct. Ages 5-12.
Cityscapes <b>Lakeside Arts - Performing Arts Studio</b>	<b>Book</b> £8	10:30AM - 12PM	Get crafty and make your own table-top green city of the future made from recycled materials. Ages 5+.
Lego Day <b>Bassetlaw Museum</b>	<b>Drop-In</b> ●	10AM - 3PM	Come and let your creative construction skills bloom with a full day of making whatever you want out of Lego. All ages.

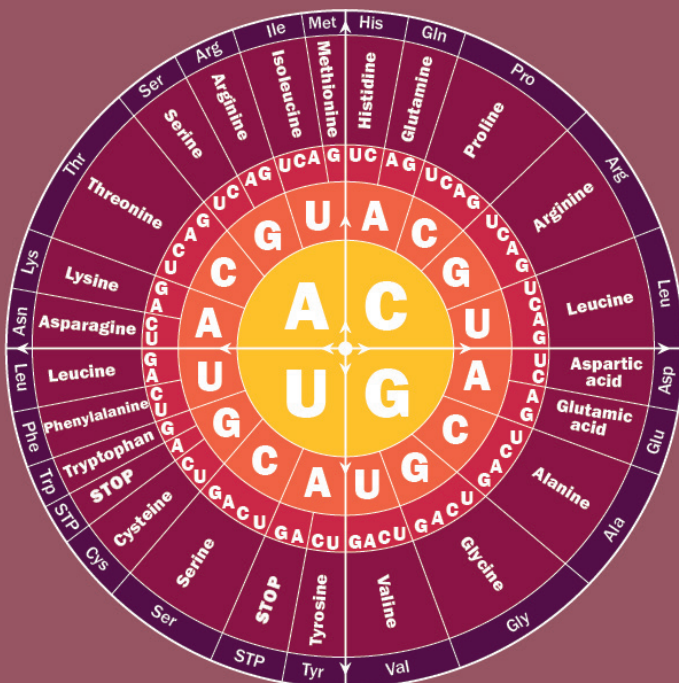
# What are Proteins?

Proteins are essential nutrients for the human body. Proteins help to make body tissues such as our muscles. Amino acids are the building blocks of proteins.

Amino acids arranged in chains are called proteins. Amino acids are made by a code of 3 bases, called codons. There are 20 types of amino acid and each one is coded for using a different pattern.

The bases can be; A,C,G or U. Take a look at the wheel of amino acids below.

You need to start in the yellow for the first base, then for the second base start in the orange layer and for the third base use the red layer. The maroon layer is what amino acid is made. For example, the bases; A,G,C code for serine, but the bases; C,C,A code for arginine.



## Test your skills

1. What does A,C,U make?
2. What does C,C,G make?
3. What does U,G,U make?
4. What does C,A,C make?
5. What does A,U,C make?

Answers:  
1:Threonine 2:Proline  
3:Cysteine 4:Histidine  
5:Isoleucine

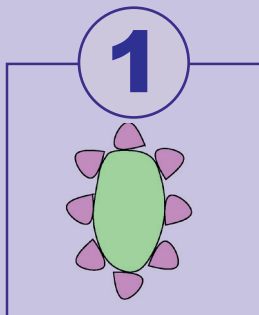
# HOW DO VACCINATIONS WORK?

## What is a vaccination?

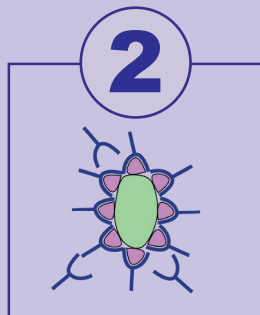
A vaccine introduces a dead or inactive disease into your body. Vaccines teach your body how to recognise and respond if the real disease enters your body.

## How do vaccines work?

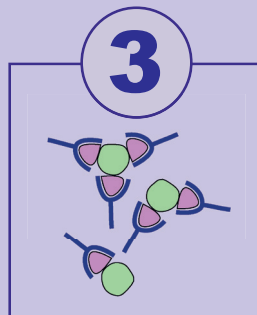
Pathogens are very small living things that cause disease. Pathogens have different shape spikes called antigens on their surface. Our bodies can recognise which antigens are not supposed to be in our body. White blood cells get rid of pathogens by releasing antibodies which break them down.



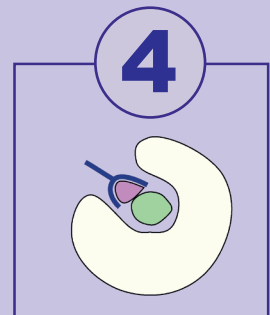
1  
A dead or inactive pathogen, with antigens on the surface, is injected into the body.



2  
Antibodies that match the antigens are released by white blood cells and attach to the pathogen.

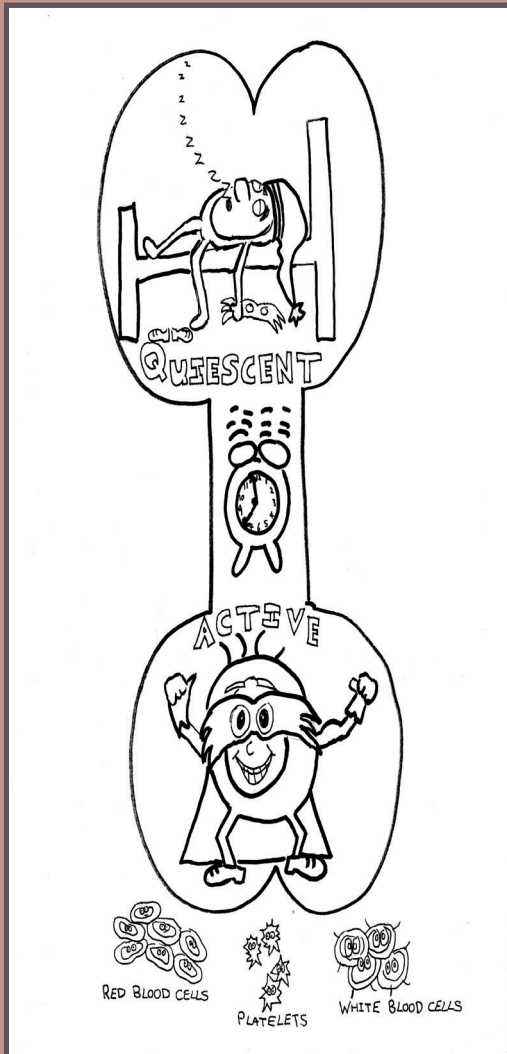


3  
Antibodies break apart the pathogen.



4  
White blood cells engulf the pathogen to destroy it.

# Blood Stem Cells



Here is a picture for you to colour in of superhero blood stem cell Elixir taking a well earned rest before they “rise and shine” for their active day’s work!

The marrow inside your bones is a blood producing factory. Blood is made up of lots of different cells that all work together to keep you alive.

- Red blood cells carry oxygen around your body
- Platelets stop you from bleeding when you cut yourself
- White blood cells are the warrior cells that fight off infection

But the real superhero of the bone marrow is a special cell type called a blood stem cell. Without these blood stem cells, you would not produce the 200 billion red blood cells that your body needs every single day. These blood stem cells are very rare, but they have the superpower to divide into two cells. One is an identical copy and the other is a cell that has started to become a blood cell and moves away from the stem cell home.
























Blood stem cells are so important in your bones that, unlike other blood cells, can put themselves to sleep, this is called quiescence (kwy - es - uhns). Quiescent stem cells stay asleep until they are needed to produce more blood cells, especially after an illness or injury. This sleeping state is very important in making sure that blood stem cells stay healthy in your bones for your whole life.

Blood stem cells are so special that they are used in the treatment of diseases.

# Viking Runes

Vikings were known for being fearsome warriors and sailing across the oceans. They traded goods, and found new lands for more treasures. They conquered these lands, using them for farming and crops.

They believed in Old Norse Gods, such as Odin and Thor, and worshipped them through prayers and rituals. Vikings introduced us to runes; their version of an alphabet, known as Elder Futhark. These were used to record very important people and events. Each rune holds a different meaning. Vikings were so important for modern life. They created many words we still use today, such as happy, cake and egg!

					
<b>F</b> Fehu cattle, wealth	<b>U</b> Uruz aurochs, strength	<b>Th</b> Thurisaz gaint, thor	<b>A</b> Ansuz god, odin	<b>R</b> Raido journey, wheel	<b>K</b> Kaunan ulcer, fire
					
<b>G</b> Gebo gift	<b>W</b> Wunjo Joy	<b>H</b> Hagalaz hail, air	<b>N</b> Naudiz need, necessity	<b>I</b> Isaz ice	<b>J</b> Jera year, harvest
					
<b>E</b> Eiwaz yew tree, tree of life	<b>P</b> Perth unclear meaning	<b>Z</b> Algiz elk protection	<b>S</b> Sowilo sun	<b>T</b> Tiwaz the god Tiwaz, victory	<b>B</b> Berkanan birch, birth
					
<b>E</b> Ehwaz horse	<b>M</b> Mannaz man	<b>L</b> Laguz water, lake	<b>Ng</b> Ingwaz the god Ingwaz, fertility	<b>O</b> Othila heritage, property	<b>D</b> Dagaz day, dawn

Try to spell your name using the runes! Runes only have 24 letters, so if one letter isn't there, just skip it!

**Your Name:**

# Did you know that some dinosaurs had brightly coloured feathers?

Author: Octavia Brayley



## When dinosaurs ruled the earth

Dinosaurs lived on Earth for around 165 million years, and they first appeared 245 million years ago during a time called the Mesozoic Era. A huge asteroid hit the Earth at the end of the Cretaceous period about 66 million years ago and it's thought that this caused the extinction of all non-bird dinosaurs.

## How are fossils formed?

After a dinosaur died and, if it was buried fast enough, its bones, teeth, and other hard body parts were turned into stone over thousands and millions of years, forming fossils.

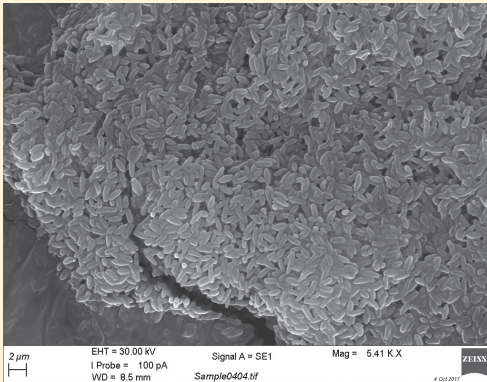


Image of the fossilised feathers under a high powered microscope showing the strange round shapes.

## Fossilised Feathers

Dinosaur researchers are called palaeontologists (pal - ee - on - tol - uh - jists) and they spend a lot of time looking at fossils. Some of them decided to look at some fossilised feathers under a powerful microscope and saw some strange round shapes. They thought these shapes were ancient bacteria.

## Colourful Dinosaurs

After some further experiments and research, palaeontologists realised that the shapes weren't bacteria after all. Instead, they were found to be small proteins called melanosomes (muh - lan - uh - sohms). These melanosomes form a substance called melanin which provides colour to our hair, skin, and eyes... and to feathers in dinosaurs!

They then realised that different shaped melanosomes made different coloured feathers. For example, sausage-shaped melanosomes indicate that the dinosaur had black feathers, and round melanosomes suggest that the dinosaur was reddish-brown.



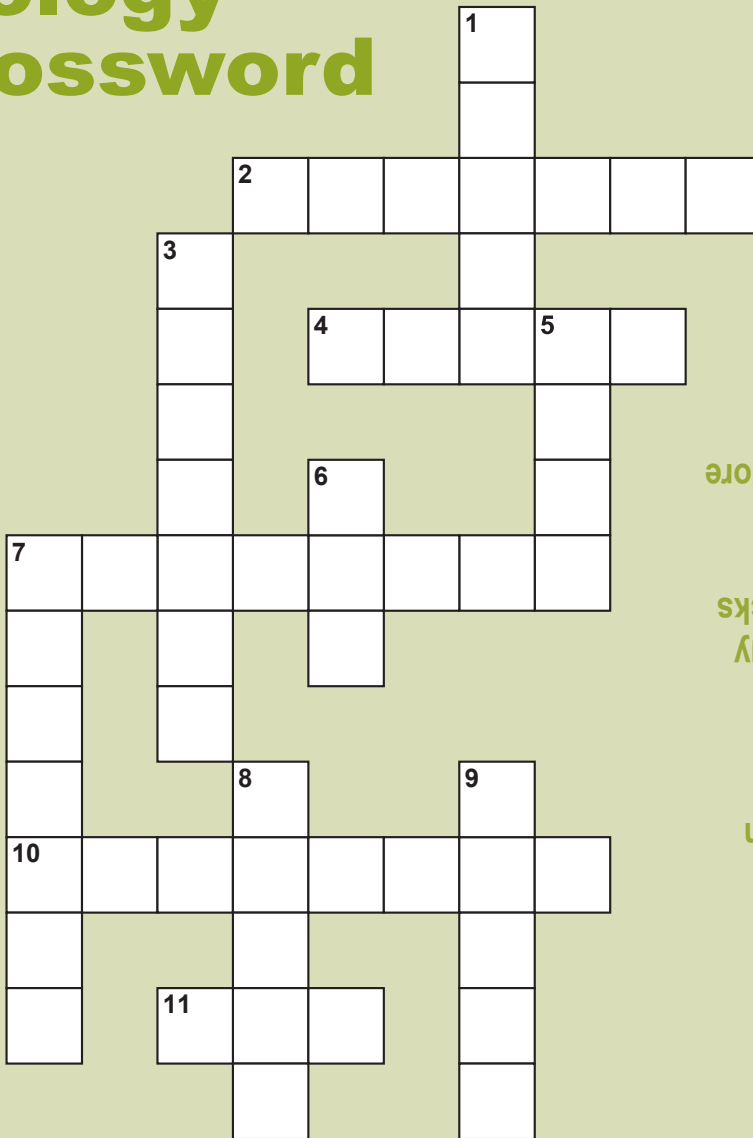
## Did you know...

...you can look at the creepy crawlies living in water to find out how clean a river is?

Lots of nasty things, like sewage, chemicals and dirty water, all go down our drains and into our rivers. Sewage Treatment Works help stop too much bad water going into streams and rivers, but sometimes they don't work properly, or sometimes they overflow if there's too much rain for the pipes to hold. Other things can also pollute rivers, such as litter and muck from fields.

To make sure our rivers are healthy, and not too many bad things are getting into the water, scientists identify and count the types of creepy crawlies in the river. Often, they look at the young forms of insects, known as 'larvae' (laa - vee) or 'nymphs' (nimfs) depending on the type of insect, which live in the water before they grow up into adults and fly off. Other animals, such as shrimps and snails, live in the water for their whole lives. Some, such as fly larvae, will live anywhere - even in really nasty water! Whereas some, such as stonefly and mayfly nymphs, will only live in nice, clean water. So if scientists find lots of the types that will live anywhere, but none of the ones which like clean water, then it means there might be pollution in the river.

# Biology Crossword



- Answers:
- 1: Heart
  - 2: Giraffe
  - 3: Cheetah
  - 4: Water
  - 5: Ears
  - 6: Cow
  - 7d: Biology
  - 7a: Buttocks
  - 8: Liver
  - 9: Brain
  - 10: Omnivore
  - 11: Leg

## Across

- 2. The tallest land animal
- 4. This makes up around 60% of the human body
- 7. Where you find the biggest muscle in the human body
- 10. Name for animals that eat meat and plants
- 11. Where you find the biggest bone in the human body

## Down

- 1. This organ pumps blood around the body
- 3. The fastest land animal
- 5. This part of your body never stops growing
- 6. This animal has four parts in their stomach
- 7. The science that studies life
- 8. The biggest internal organ humans have
- 9. The organ that doesn't feel pain

# Meet the Creatures Amazing

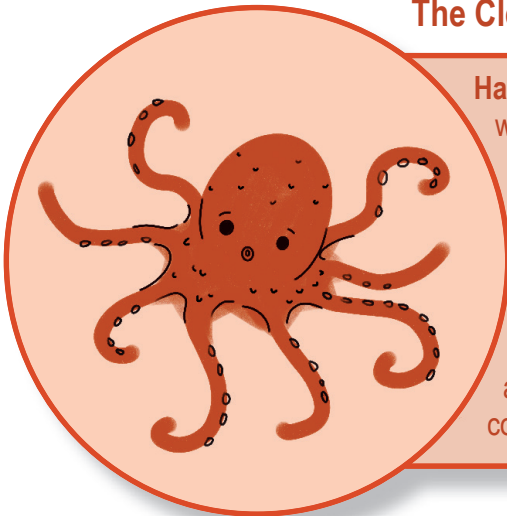
## The Amazing Seahorse



**Habitat:** Seahorses can be found in warm, tropical oceans all around the world. They love to hide among seagrass and coral reefs.

**Fun Fact:** Did you know that the male seahorses are the ones that give birth instead of the females? That's right! The daddy seahorse carries the baby seahorses in a special pouch until they are ready to be born.

## The Clever Octopus



**Habitat:** Octopuses live in oceans all over the world, from shallow waters to the deep sea. They are masters of camouflage, hiding among rocks and coral.

**Fun Fact:** Octopuses are super smart! They can solve puzzles, open jars, and even escape from tricky situations. They have three hearts and blue blood, which helps them survive in the cold depths of the ocean.

# res: Spotlight on Animals

## The Majestic Snow Leopard

**Habitat:** Snow leopards are true mountain kings and queens. They roam the high and snowy tops of the Himalayan mountains and other central Asian mountains.

**Fun Fact:** Snow leopards are super sneaky and have thick fur with spots like a jaguar. These spots help them blend into their snowy surroundings. They're the ultimate stealthy hunters, and they can leap far to catch their prey.



## The Quokka, the Happiest Animal on Earth

**Habitat:** Quokkas live in Australia, and they're known to be the happiest animals around. You can find them on small islands and along the coast.

**Fun Fact:** Quokkas are famous for their adorable smiles! They have the cutest, most cheerful expressions, making them the "selfie stars" of the animal kingdom. People often call them the "world's happiest animal."



# What does your skin do for you?

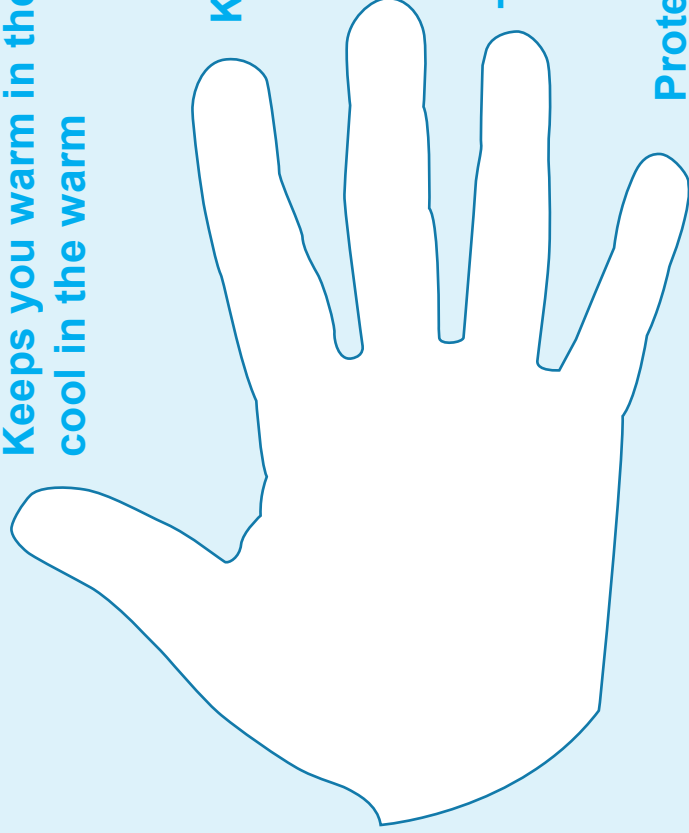
Keeps you warm in the cool and cool in the warm

Keeps your insides inside

Makes vitamin D to keep our bones, muscles and teeth healthy

Tells you how things feel

Protects you from germs and allergens



Use colours and patterns to add your own decorations to the hand!

# Why is science for you?

At 10, I wanted to be a pilot.  
At 16, I wanted to be a music teacher.  
At 21, I wanted to run music events.

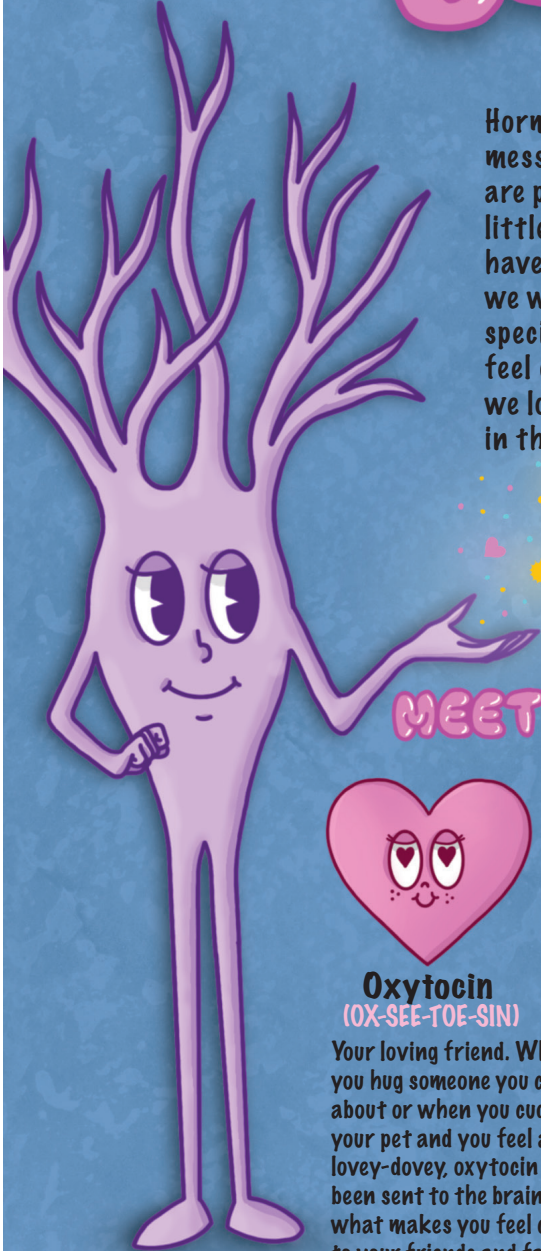
At no point when I was growing up did I think that one day I would be an award winning primary science teacher with my own YouTube channel promoting STEM (Science, Technology, Engineering and Maths) to younger generations, yet here I am. At your age, you don't need to have everything figured out about what you want to do when you grow up. This is your time to explore and discover. Science helps you develop new ways of thinking as you solve new problems or analyse results, providing you with mental tools for ongoing success.



Don't wait for science to come to you in the classroom; science can take place anywhere! There are lots of resources online - such as my YouTube videos 'STEM with Mr N' - where you can learn about low-cost science experiments that you can do at home with family and friends.

Another amazing thing about science is that no matter what you are passionate about, there is a place for you in the scientific community. There are lots of STEM careers out there, with new ones cropping up all the time, where different passions can be combined, so have an open mind. Find what gets you excited and makes you want to know more, and whether that's making pancakes or putting rockets into space doesn't really matter; what matters is your passion and enthusiasm.

# THE BRAINY BUNCH



Hormones are chemicals in the body that send a message to another part of the body. These hormones are produced in your brain. Happy hormones are like little helpers in our brains that make us feel good. We have them because they help in different ways which we will explain to you soon! This brainy bunch are like a special group of friends in our brains that make sure we feel good and create strong connections with the people we love - such as family. These hormones can be found in the brain (serotonin can also be found in the gut!).

## MEET THE HAPPY HORMONES



**Oxytocin**  
(OX-SEE-TOE-SIN)

Your loving friend. When you hug someone you care about or when you cuddle your pet and you feel all lovey-dovey, oxytocin has been sent to the brain! It is what makes you feel closer to your friends and family. Oxytocin also known as the love hormone - that might be easier for you to remember!



**Dopamine**  
(DOE-PAH-MEEN)

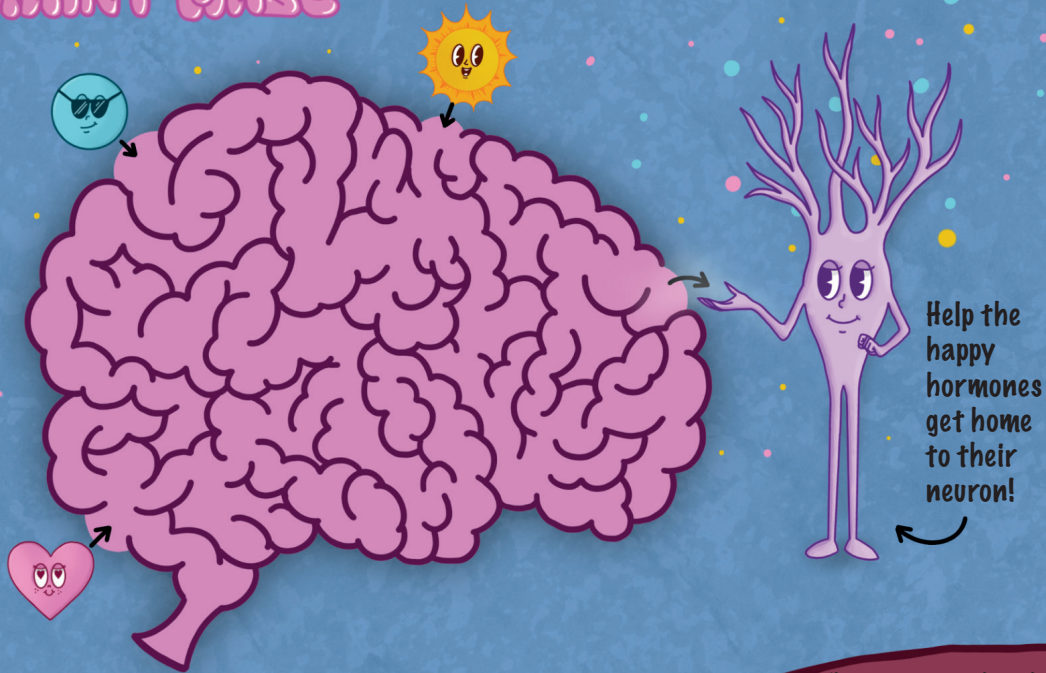
Dopamine is the cheerleader of the bunch! When you do things that are exciting, like playing with your friends or sharing toys with your friends, dopamine gets released to come and cheer you on and motivate you!



**Serotonin**  
(SEH-KOE-TOE-NIN)

Serotonin - the cool, calm and collected friend. Serotonin is the hormone that likes it when you do something that makes you happy! For example, when someone tells you "Well done!", serotonin releases to make sure you also feel cool, calm and collected. This hormone also loves to have sleepovers in your brain to help you sleep!

# BRAINY MASE



## THE HAPPY HORMONES

They've noticed that their brain is sad...



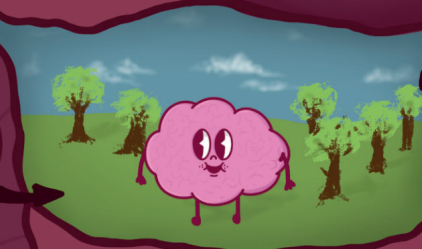
Serotonin, dopamine and oxytocin don't know what to do...



### SEROTONIN



I have an idea!



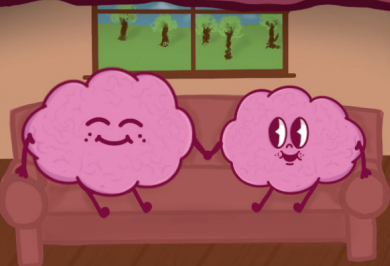
Serotonin suggested to go and spend time in nature. The brain feels happy, calm and peace for now...

### OXYTOCIN



I have an idea!

Oxytocin suggested to spend time with family and friends... Now the brain feels confident and full of love...

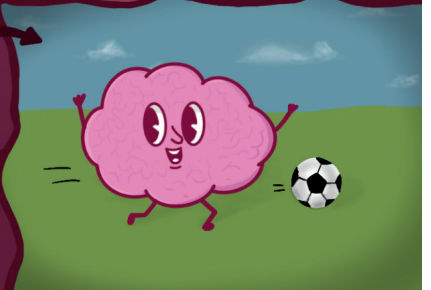


Dopamine taught the brain how to learn a new skill... The brain is now truly happy again! Well done happy hormones!

### DOPAMINE



I have an idea!



# Emergency Pentagon



A pentagon is a five sided shape that's useful for architects and mathematicians. Here's a simple way to fold a pentagon from a single strip of paper, and it only takes a few seconds!

## Equipment

**needed:** a strip of paper (a piece the size of a margin from A4 - around 1cm wide)

**What to do:** Take the strip of paper, and tie a knot in it - as you would in a piece of string. Then, gently pull the ends through until it is tight, and fold the whole thing flat. Finally, fold the extra end bits away behind the pentagon, or cut them off.

You have now folded a perfect regular pentagon!

## Why does this work?

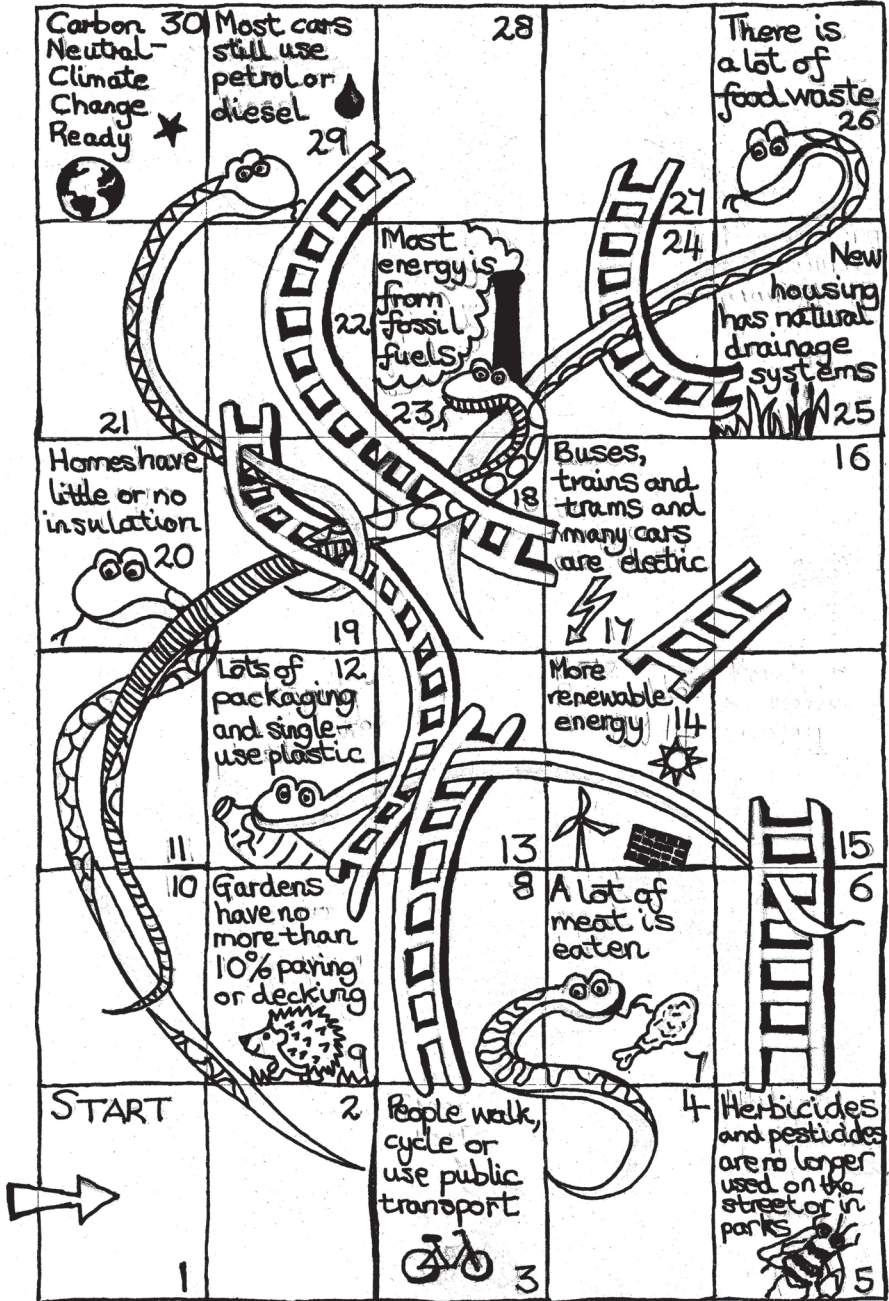
The pentagon you make is folded so the length of each side of the pentagon is the same. If you crease it and unfold it you can see that the line which was the edge of the pentagon cuts the strip of paper at the same angle each time (72 degrees - check with your protractor!), and so the length of this line will always be the same.

## Ideas for using your amazing pentagon:

- Placing the pentagon in the middle of a pizza or cake will allow you to cut it into five equal pieces
- You can check whether an angle is exactly 108 degrees by comparing it to your pentagon
- Pentagons are very stylish - why not make a necklace or earrings from

All 3 Nottingham City Museum sites (Wollaton Hall, Nottingham Castle, Newstead Abbey) are now part of the Natural History Museum London's Urban Nature Project. There are activities school classes or other groups can do such as making your own Climate Change snakes and ladders game. This is one we made but you could have a go at making your own. Ours is about what councils or people living in towns and cities could do. Send your designs to us at: [sue.mallender@nottinghamcity.gov.uk](mailto:sue.mallender@nottinghamcity.gov.uk)

**To play:** You need counters, buttons, or small toys, one for each player, and a dice. To start, throw the dice and move your counter along the numbered rectangles matching the number on the dice. If you land on a ladder climb up! If you land on a snake slide down! Taking it in turns, the winner is the one that reaches the Carbon Neutral rectangle first.



# What is a Chemical Engineer?



My name is Hannah and I am a chemical engineer. Chemical engineers help to make lots of things you use everyday such as; food, drinks, medicines, batteries, washing liquid and much more! To make these products, scientists first mix all the chemicals needed in the lab. This might be in a small test tube. Chemical engineers then choose the correct equipment and calculate how much chemicals are needed to make lots of the product!

## Challenge Time!

See if you can complete the word search below. The word search is filled with 5 words that chemical engineers use nearly every day!

N O E N C A Y G A  
S F E F H P R L L  
L T S S E C O R P  
R E L P M X T S L  
H P I Y I B C R I  
U P H M C A A L W  
E A A E A H E A A  
O E H H L S R T T  
R N A E H M N A M

## Engineering Challenge!

Using an old water bottle, you are challenged to design the best boat possible! Once the boat is finished, fill it with baking powder and vinegar which will react and produce gas. You will now need to decide the best way to release this gas from the back of the boat, making the boat drive forwards!

PROCESS

PIPE

MIX

REACTOR

CHEMICAL



# The Secret Building Control Superheroes

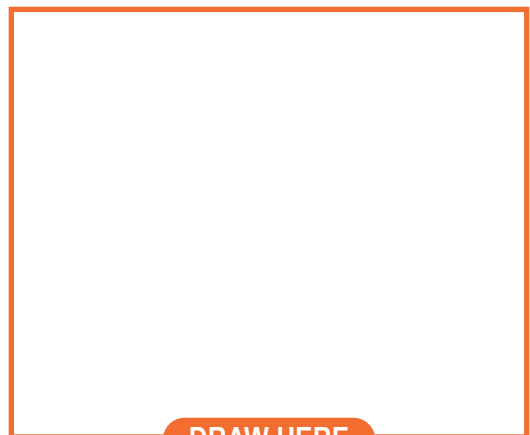
By Jack Calveley, LABC Building Control

My name is Jack and I am from LABC Building Control. You may not have heard of us, but the Building Control team is very important as we are responsible for making sure all homes and buildings are safe and secure. The hidden superheroes of the building trade you might say!

I have always been passionate about buildings, the different ways homes are built, and how they are designed to protect us for a long time and shelter us from all weather conditions. We don't wear capes, or a superhero outfit but if you are lucky, you might see us in our bright yellow vests and hard hats.

Our main job is to use our superpowers to supervise the work going on to build a home, check plans for any future work and also making sure all builders are using the right materials.

What would you look like as a Building Control Superhero? Draw yourself and don't forget your hard hat!



DRAW HERE

# Atom Power!

## Where does electricity come from?

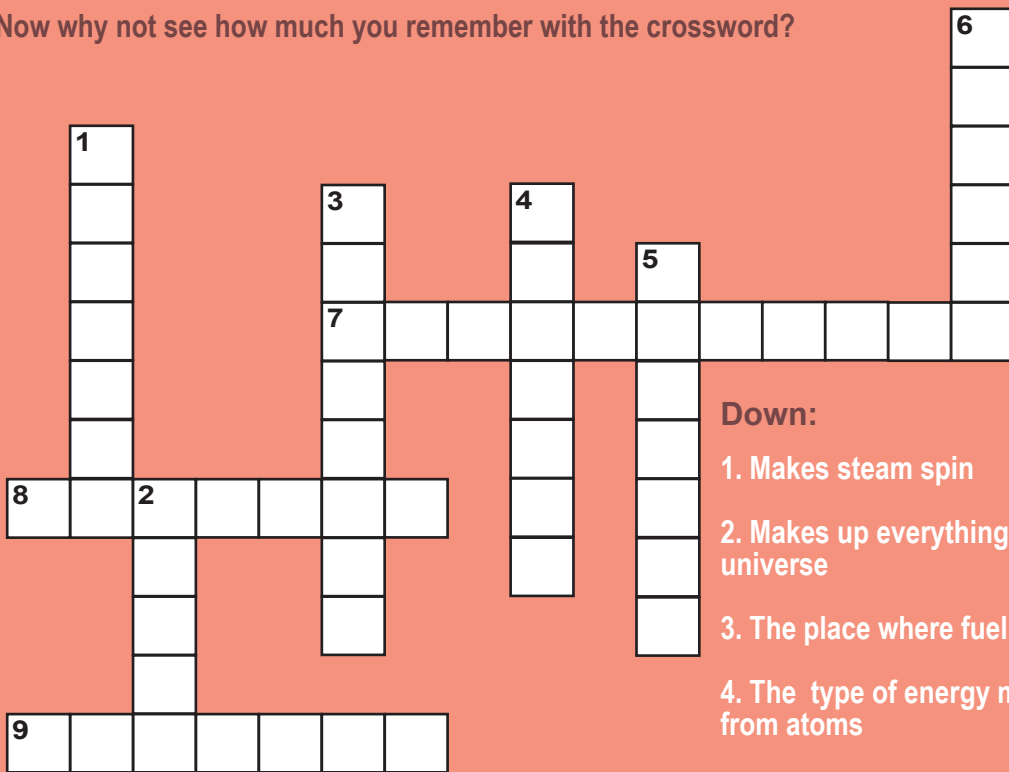
There are many different ways of generating power, and one of the most exciting comes from atoms. **Atoms** are tiny particles which make up everything in the universe.

The name for energy created from these atoms is “**nuclear**” energy. When the core (or nucleus) of the atom is broken apart, a lot of **energy** is released. This is a process called **fission**.

A nuclear **reactor** is the machine in a power plant where this all happens. Some atoms are easier to split apart than others, like **uranium**, and these are stored as fuel in special **fuel rods**.

The energy released is used to heat water. The water turns to steam and spins a **turbine** (like a windmill). This spinning is used to produce the **electricity** we can use in homes and schools.

Now why not see how much you remember with the crossword?



### Across:

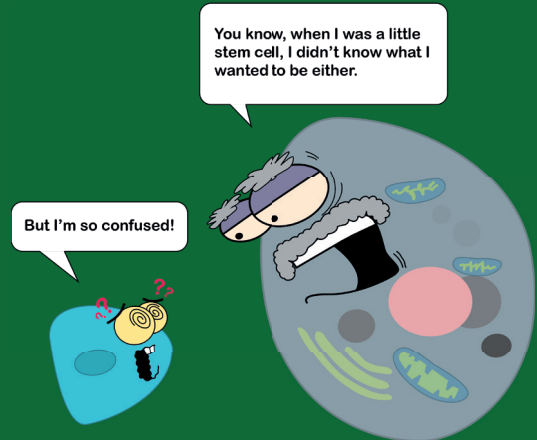
7. Produced in a nuclear power plant
8. Important machine in a nuclear power plant
9. The process when energy is released by an atom splitting

### Down:

1. Makes steam spin
2. Makes up everything in the universe
3. The place where fuel is stored
4. The type of energy made from atoms
5. A common fuel
6. Released during a reaction

# Superb Stem Cells

Some cells in our body haven't decided what they want to be yet. These undifferentiated cells are called stem cells. These cells are interesting to researchers at the Biodiscovery Institute (BDI) at the Uni of Nottingham. They are trying to turn stem cells into heart cells in order to treat problems with the heart.



## What is the BDI doing?

In a laboratory at the BDI, there's a robot named Brian. He plays a huge role in the investigation into stem cells and works with hundreds of cells at one time to speed up the process of forming these heart cells.

## Why are stem cells important, and how do the BDI raise awareness?

Not only are stem cells useful for treating illness, but they can also be used to test new medicines for safety and effectiveness before they're used on us. With stem cells, we're able to understand how disease occurs by studying how stem cells become different, specialised cells that carry out specific roles in our bodies.

Dr Aishah Nasir at the BDI wanted to connect the beauty of stem cells and art to teach the public about how important stem cells are. Through the 'HeART' project workshops, colourful images of cells are now available for anyone to see.

By Aaliyah Connolly

Thanks for reading!



## GLOSSARY

**Undifferentiated** – doesn't have a special function yet.

**Specific** – special or unique to something.

**Cells** – building blocks for all living things.

# What have engineers ever done for us?

Engineers have to learn about the world around them because they design and build the world we all live in. Think about your day so far:

Did you wake up in a building?

Did you use the bathroom to have a wash, use the toilet and brush your teeth?

Did you watch the TV when you ate breakfast?

Did you get in the car to go to school?

Or did you walk to school on the pavement along the side of the road the cars were on?

Civil, mechanical, electrical, structural, material, bio-chemical and automotive engineers designed and built all the things you would have used to do the above.

Engineers are also looking for new ways to help keep the earth a healthy and safe place for us all to live in the future, that is part of the job of a Sustainability Assessor. They help the teams to work out how sustainable their projects are, and how to improve this in the future.

Can you answer the question below about important engineers and inventions:

## Quiz

1. Who invented the lightbulb?



2. Which was invented first, the steam train or the bicycle?

3. Which kitchen appliance was invented by accident: Fridge, Microwave, Toaster or Oven?

4. Which was invented first, the landline telephone or the lightbulb?

5. When were fireworks invented?

6. How many kilometres long is the longest bridge in the world?

7. When was the first boat made?



8. What ancient engineering device stores potential energy and then uses it to fling an object great distance?

9. Was Nintendo founded in 1889, 1946 or 1975?

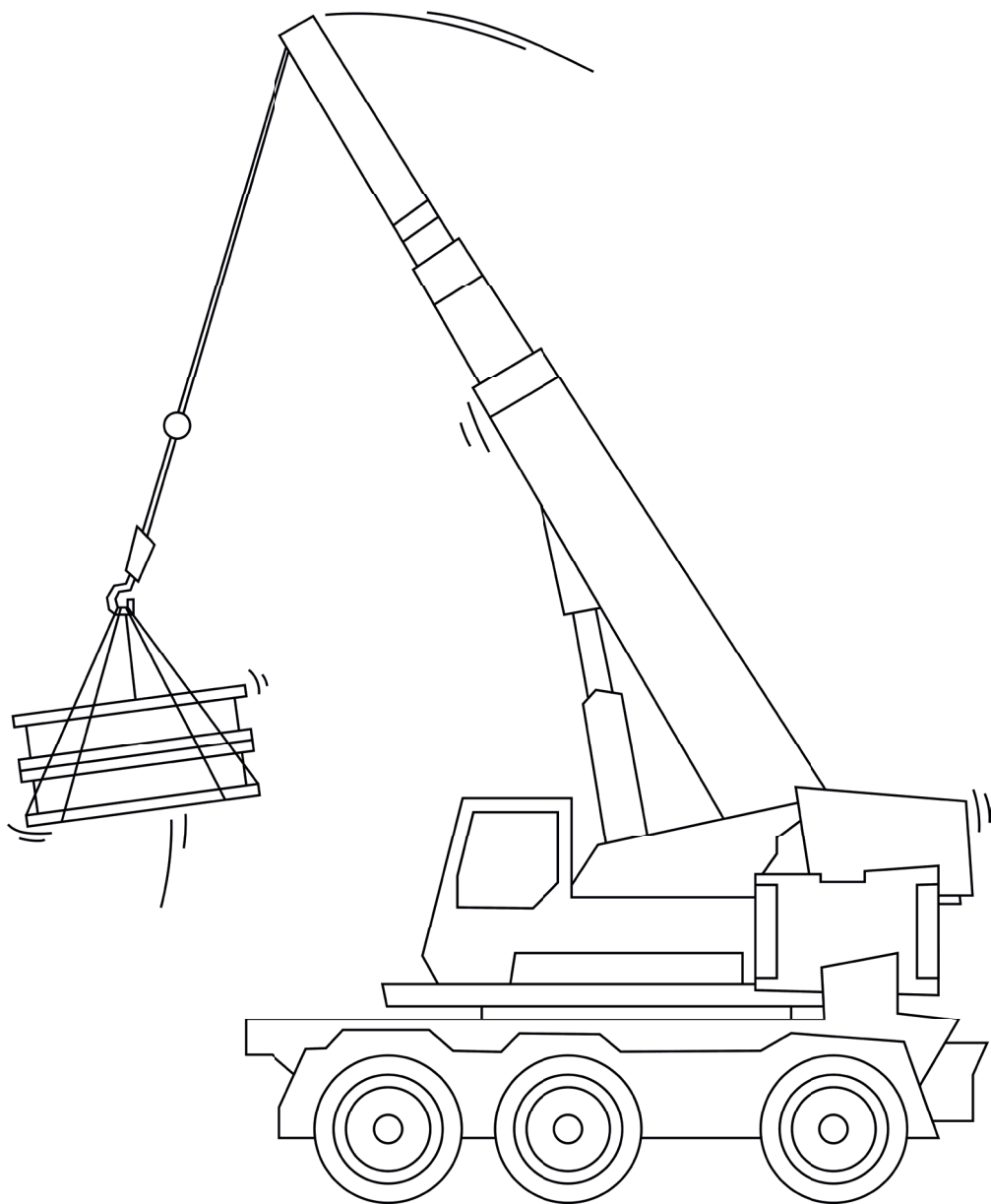
10. What makes the bubbles in fizzy pop?



Answers

1. Thomas Edison
2. The steam train! The steam train in 1804, the bicycle in 1817
3. Microwave
4. The telephone. The telephone in 1876, the lightbulb in 1879
5. 200BC
6. 114km long, it is the 'Danyang-Kunshan Grand' in China
7. 8,000 years ago
8. Catapult
9. 1889, they originally made playing cards
10. Carbon Dioxide

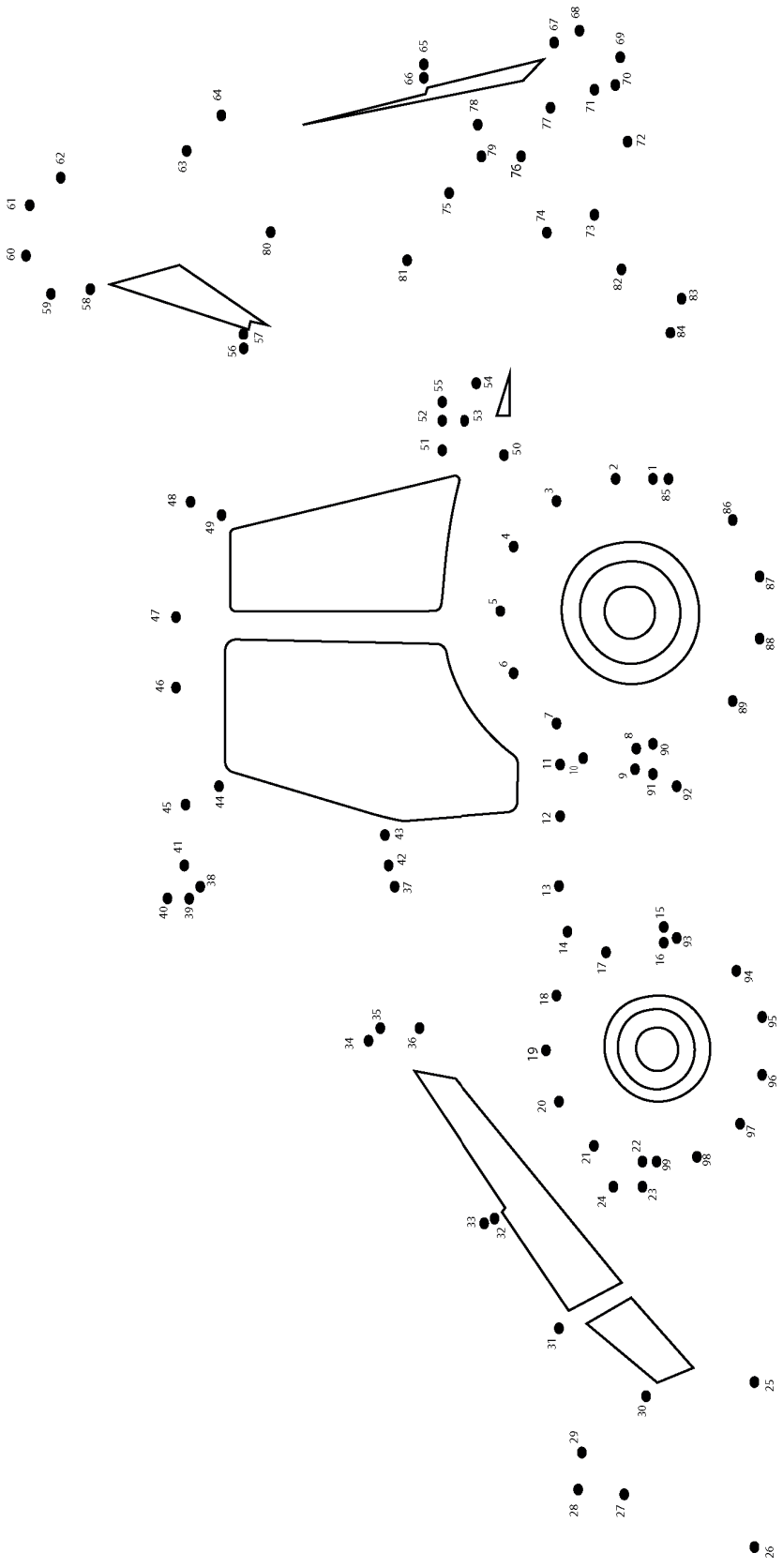
**Jackson**



**Colour in the crane**

# Dot to Dot

Join the dots to reveal the picture underneath.



# Could you be an Ocean Hero?

The ocean takes up a huge part of the planet and is home to so many animals and plants. Some are large and can be seen from the coast (if you are lucky) and others are so tiny that you need a microscope to find them. All of them share the ocean as their home. Many of us love spending time at the ocean, maybe you have been at the beach recently. It is very important that we take care of the ocean to be an ocean hero and here are some ways you can do that.

- Just look, don't touch! Many animals and plants are very sensitive. It is tempting to pick small creatures up, but imagine you were sitting in your garden, and someone disturbed you.
- Do not take animals home from the beach, they are not pets. If you want to have an aquarium at home, it is best to buy them from a local pet store.
- Why not join the next beach clean-up? Or ask grown-ups to bring a bag and gloves along, so you can pick up plastic next time. You could even see who gathers the most beach litter, the winner gets an ice cream?
- If you take toys or other items to the beach with you, make sure you collect everything at the end of the day and take it back home. They can end up in the ocean otherwise, where it may cause a lot of harm.
- If you see an injured wild animal on the beach, ask an adult to call your local response team. Make sure not to approach the animal, they can carry diseases that we humans could catch as well.

# Interview with Munsanda Kasanyinga



## 1) Tell me about yourself.

I am an experienced hairstylist and make up artist and I love to transform my clients to look their best. I started my business called Gracious Hair Designs because I want to reach more people with my skills. I want to branch into hair education more and provide young people with skills they can use to make a career for themselves whilst expressing themselves creatively. I am also training to become a Physician Associate which is a job where I'll help doctors to treat patients.

## 2) Why did you decide to choose your career?

I chose to study Biomedical Science (a mix of biology and medicine) at university but soon after my placement year I realised I wanted a more hands-on role in healthcare. This led me to study Physician Associate Studies.

## 3) Why did you decide to change career paths?

I knew I needed to change as I didn't enjoy my placement year working in a lab. I took a gap year and spent the year working for myself full-time. I really enjoyed this time expanding and growing my business. During this time I decided to apply to become a Physician Associate.

## 4) Can you give some advice to our young readers?

I would say, don't feel trapped in a path of life you thought you might enjoy but later had a change of heart. The moment you feel like you can't see yourself in a career long-term, that is the moment you need to think about what will make you happy. For me I want a career in healthcare but I want to build an enterprise with my business Gracious Hair Designs to eventually work full-time with what I am most passionate about. I don't want to limit myself to one thing so I am finding a balance with both of my passions. You can do it too. Never give up on yourself, make a plan, seek advice from those that are in an industry you want to go into.

## 5) What is the best thing about your business/ career?

The best thing about my job running Gracious Hair Designs is that I am able to meet new people daily and impact their lives by doing their hair. I love the confidence they leave with when I'm able to help them look their best. With my future career as a Physician Associate, I am looking forward to being able to listen and help people and make them feel heard.

**This interview was completed by Laura from Wilsthorpe School as part of a one week work placement at Ignite! in July 2023.**

# To get to the right answer, you need to ask the right questions



When we ask really good questions, we uncover new things, find out better information and build our learning. Researchers are very good at asking the right questions at the right time. They think about what they want to find out, and choose the right types of questions to ask.

## Why is asking questions useful?



To get information and learn new things

To understand something in more detail

To explore other people's experiences and opinions

To uncover ways to use the information you have found out.

## Types of Questions

**Closed questions** - Closed questions are questions you can answer with a single word or even just 'yes' or 'no'.

They sound like:

"Do you like biscuits?"

"Have you got PE today?"



**Open questions** - Open questions will help you get longer answers from people than closed questions. They need more than a yes or no answer and often start with words like 'how', 'why', and 'what', 'describe', 'tell me about'. Open questions encourage people to talk and tell you more.

Some examples might be:

"If you could invent a new biscuit, what would it be like?"

## Activity

Why don't you try practising your research question skills by interviewing a friend or family member?



What sorts of **open questions** could you ask them?

Can you turn your closed question into an open question? You can always ask "why?" after a closed question to find out more!

# Now for some contributions from pupils at The Wells Academy...

## Space

Where everything rests in peace,  
Nothing to be disturbed by,  
The planets floating around,  
Orbiting the Sun.

The sounds, it's quiet,  
The feeling of your body's muscles loosening,  
You are at peace,  
You are in Space.

## Mercury Facts!

Mercury is a metal that is liquid at room temperature, which is not normal for metals.

You can't touch mercury with your bare skin.

Did you know that mercury occurs more rarely than gold?



Mercury the metal



Mercury the planet

# Activities

**Match the picture to the word**



**Beaker**



**Magnet**

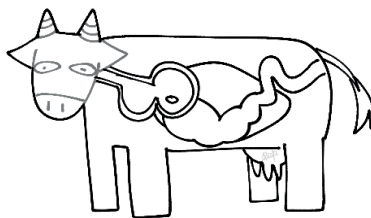


**Bunsen Burner**



**Microscope**

**Draw the cow's habitat**



# Where are all the butterflies and moths in the winter?



Often when we think of butterflies we think of warm days, with colourful adults flying around from flower to flower in the sunshine. But where are the butterflies and moths during the winter?

Like other insects, butterflies and moths rely on external sources of heat (like the sun) to warm up their bodies so that they can be active. In the UK, the winter is too cold, and butterflies and moths cannot get warm enough to be active. Butterflies and moths have evolved different ways of coping with the cold during the winter months.

Some types of butterflies and moths go into a dormant state, which is a little bit like hibernation, so that they can survive the long, cold winter months. This is called overwintering. Although different types of butterflies and moths can enter this dormant state in either the egg, caterpillar, chrysalis or adult life stage, the majority of UK butterflies and moths overwinter in the caterpillar stage. Overwintering caterpillars might shelter and hide in the leaves of their food plant, or at the base of plants like grass tussocks.

During the winter, if you look in sheltered spots (like log piles, rock crevices, hollows in tree trunks), or in sheltered structures (like sheds, bug houses, bird houses) you might see overwintering adult butterflies. You might need to look very carefully to spot them! These dormant adults sit very still, resting with their wings closed, so that their darker-coloured underwings are camouflaged with their surroundings. Be careful and try not to disturb these overwintering adults. They will not have enough energy to fly around for long, and they will not be able to find food or other places to shelter to keep themselves alive.

Some types of UK moths have adults that only fly during the winter. Moths like the December Moth have very thick 'fur-like hairs' on their bodies which help to keep them warm. Other types of moth, like the Winter Moth have light, energy-efficient bodies that enable their adults to fly during the colder

# Activities

## Binary code Alphabet:

A	01000001
B	01000010
C	01000011
D	01000100
E	01000101
F	01000110
G	01000111
H	01001000
I	01001001
J	01001010
K	01001011
L	01001100
M	01001101

N	01001110
O	01001111
P	01010000
Q	01010001
R	01010010
S	01010011
T	01010100
U	01010101
V	01010110
W	01010111
X	01011000
Y	01011001
Z	01011010

1. Use the binary code alphabet to translate each of the binary codes (below) to reveal the name of 2 types of UK butterfly that you could find overwintering as adults.

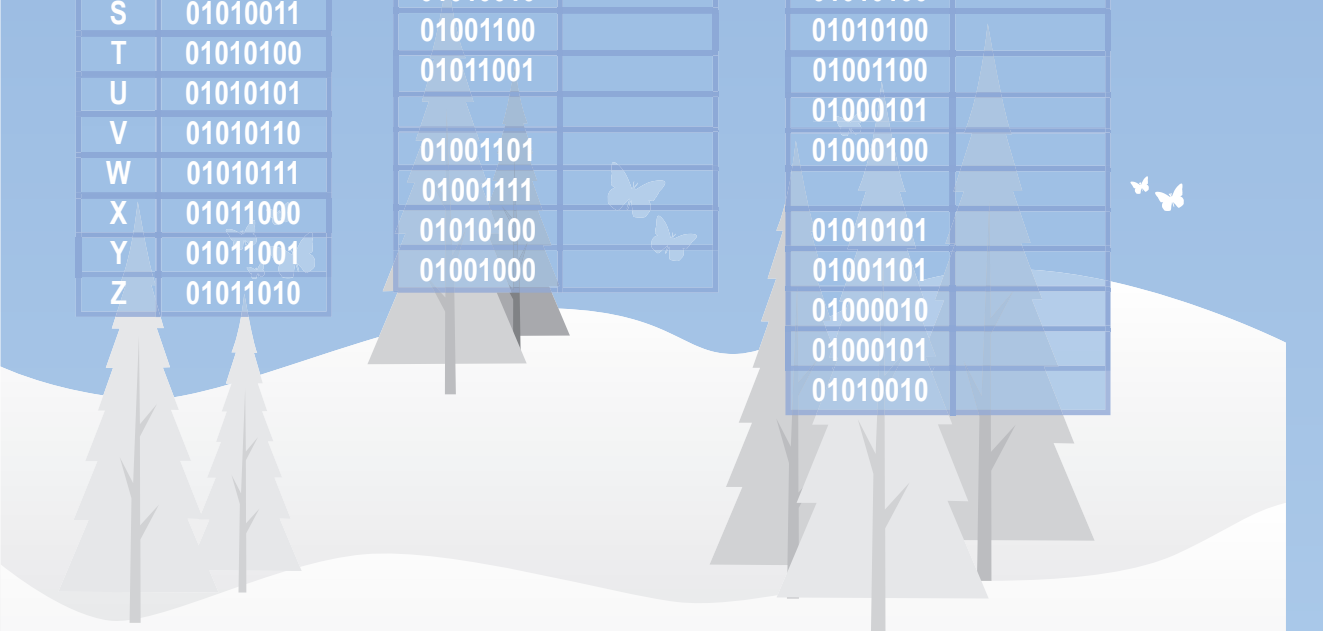
	Butterfly 1
Binary Code	Your Letter
01000011	
01001111	
01001101	
01001101	
01000001	

	Butterfly 2
Binary Code	Your Letter
01010000	
01000101	
01000001	
01000011	
01001111	
01000011	
01001011	

2. Use the binary code alphabet to translate each of the binary codes (below) to reveal the name of 2 types of UK moth that you could find flying about as adults during the winter.

	Moth 1
Binary Code	Your Letter
01000101	
01000001	
01010010	
01001100	
01011001	
01001101	
01001111	
01010100	
01001000	

	Moth 1
Binary Code	Your Letter
01001101	
01001111	
01010100	
01010100	
01001100	
01000101	
01000100	
01010101	
01001101	
01000010	
01000101	
01010010	



# Fun Facts

1. You can find butterflies and moths on every continent in the world except one – Antarctica, where the temperatures are too cold for them to survive.
2. Some types of butterfly in the UK can overwinter in more than one life stage – the Speckled Wood Butterfly can over-winter as either a caterpillar or a chrysalis
3. Some types of caterpillar can concentrate chemicals called cryoprotectants in the cells inside their bodies. These chemicals stop them from freezing into little caterpillar-shaped ice cubes!
4. Larva is the scientific word for a caterpillar.



Learn more about butterflies and moths, visit [Butterflies Under Pressure](#) online.



# Thank you!

Each year, the Festival of Science and Curiosity reaches more children, teachers and families across Nottingham and Nottinghamshire, and we are so grateful to everyone who has helped the 2024 festival to inspire curiosity and ignite passions for science.

The FOSAC team would like to say a huge thank you to everyone who has been a part of bringing the festival together for its ninth year, including our Festival Network, our partners, and our contributors and volunteers who are running activities, workshops and events all across the county.

A very special thank you also goes to our brilliant Confetti graphic designer Red Fadri and illustrators Jamie Goffin, Emily Safina, Sunny Platts, Antoni Kubaszczyk, James Ennin, Sophia Bensalem and Mike Milton for their exceptional hard work and creativity. Thank you also to the Year 7 pupils from The Wells Academy who helped us copy-edit the magazine with their feedback and ideas.

And finally, a massive thank you to everyone who has participated in the Festival of Science and Curiosity this year; whether you took part in a workshop, met a scientist at your school, got your hands on real scientific equipment, or read an article in this magazine, we really appreciate your support and hope you found something new that's ignited your curiosity!

With love,  
FOSAC Team and Board of Trustees



Produced by



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