# The Spark

Magazine

PUZZLES, QUIZZES, EXPERIMENTS

ISSUE No18



**BAMBOOZLING BRAIN TEASERS**

**MAKE A KALEIDOSCOPE**

**CITRUS SCIENCE**

**MEET AN EDUCATION OFFICER**

GLASGOW SCIENCE CENTRE

Celebrating 21 years

# Inside

This issue




## HELLO!

Grab a woolly jumper, and a mug of hot chocolate and join us for the winter edition of The Spark magazine!

We will be diving into freezing waters to discover how animals stay warm in extremely cold conditions. We're also discovering the popping power of citrus, and looking through a kaleidoscope to explore the properties of light.

We're also asking the question: 'what do you want to be when you grow up' as we explore different jobs in science.

**Best wishes and happy holidays,**
**Glasgow Science Centre**

## SHARE YOUR PICS WITH US

If you try any of our activities, please show us how they turned out! Send your favourite pictures to CLDteam@gsc.org.uk or share with us @TheBothyGSC on Twitter.

## MINI GAME

### Can you help the skier reach the bottom of the mountain safely?

**Solution on back page**



Page 13



## Meet Sheila Kanani

**who works at the Royal Astronomical Society, on page 13.**

# Brilliant Blubber



**It must be hard for mammals that live in cold water to stay warm, especially in winter. So how do they do it?**









Animals like orcas, dolphins, porpoises, and seals all have a thick layer of fat called blubber that can help keep them warm!

Blubber acts as an insulator. An insulator doesn't allow heat to escape easily. Heat from the animal's body can't travel easily through the blubber, so they stay nice and warm even in ice-cold water.

Blubber can also help these animals stay afloat and acts as an energy source.



# Ready, Set: Blubber!

**Find out what makes the best blubber in this chilly experiment.**

**You are going to test how long you can keep your hand under water while using different materials as insulators.**



## What will you need?

- A bucket or bowl of cold water
- Ice cubes
- A stopwatch or timer
- An oven glove
- A towel
- An adult's supervision

## What to do



**Step 1.** Fill a bucket with cold water and add some ice cubes to create the icy water temperatures our marine mammals would encounter.

**Step 2.** Ask a friend to time how long you can keep your bare hand in the cold water before it becomes too uncomfortable. **Remove your hand as soon as it begins to feel uncomfortable**. Start the timer when you put your hand in the water, stop the timer when you take it out. Dry your hand, then write your results in the table below.

**Step 3.** Now try the experiment again, but this time put your hand in an oven glove and put your gloved hand in the water. Try not let any water come in through the cuff of the glove.

**Did you manage to keep your gloved hand in the water for longer? This is how blubber works; it insulates your body from the cold water to keep you warm! Test other materials and see if you can find a better insulator.**

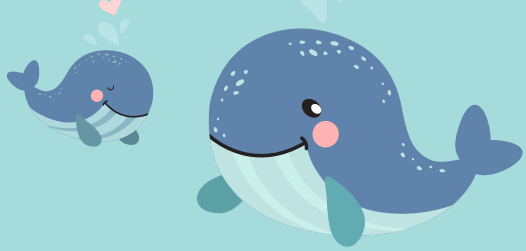
| Item | Time |
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## SPARK FUNNIES



**What's a whale's favourite sweetie?**

**Blubbergum!**



# Bamboozle your Brain!



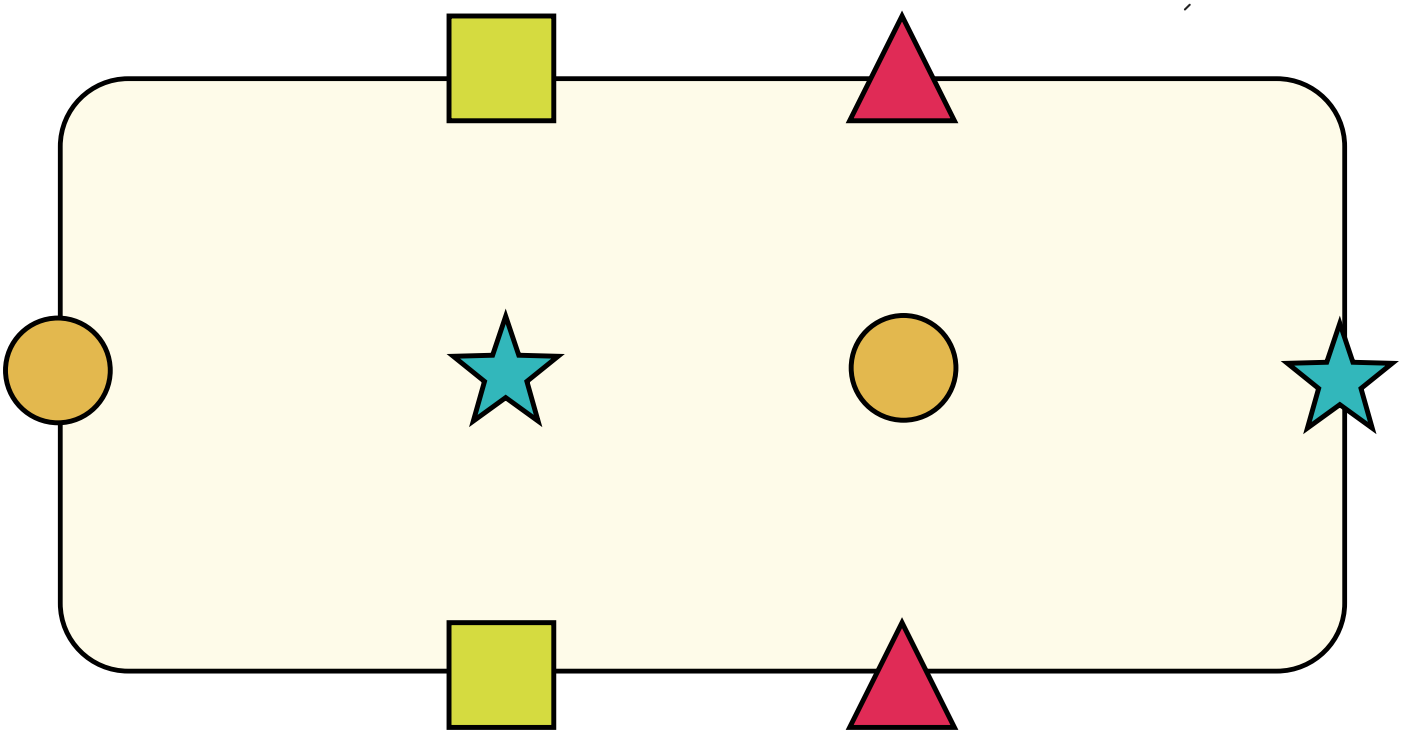
## Can you solve these tricky puzzles?

### Test your friends and family and see how well they do!

## Loopy lines

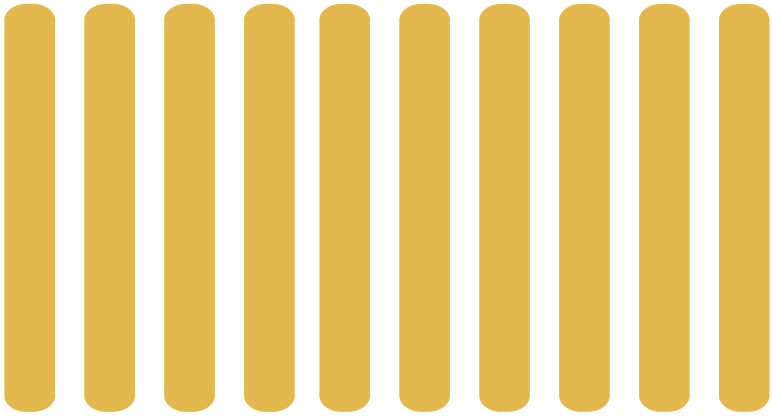



Can you connect each similar shape together with a line? The lines cannot cross one another or go outside the rectangular box.



## Ten to Five

Place ten lollipop sticks in front of you like this.



Now turn the ten lollipop sticks into five.

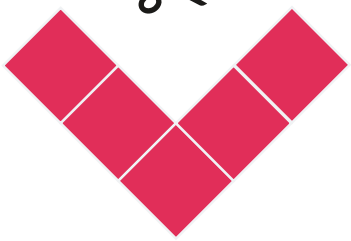
They cannot be taken off the table or stacked on top of each other.

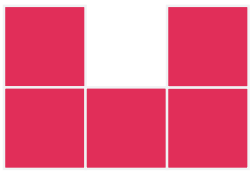
**You don't need to use lollipop sticks, ten pencils will work just as well!**

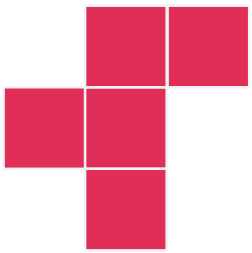
# Puzzling Pentominoes

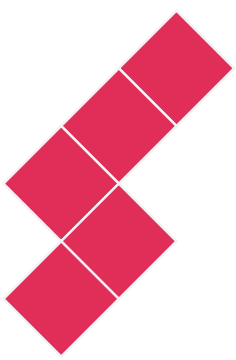
Pentominoes are shapes made from five squares joined together. Cut out the shapes and see if you can use them to solve the puzzles on the next page.

## Puzzle 1

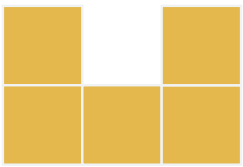


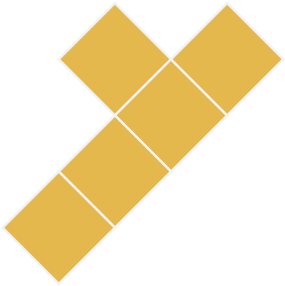


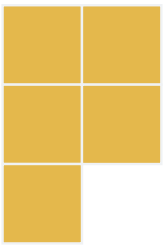




## Puzzle 2





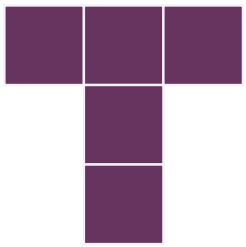


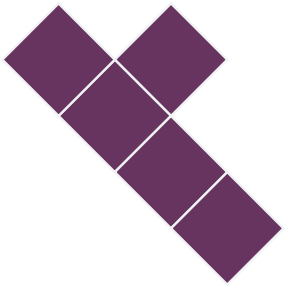


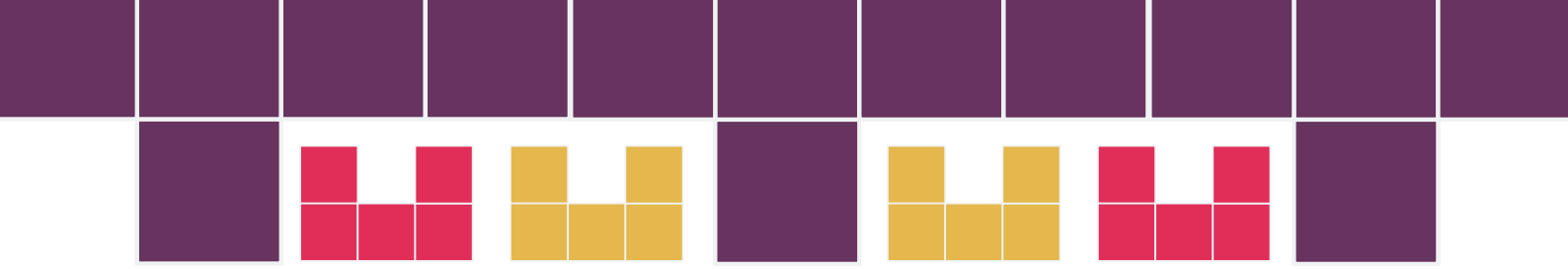
## Puzzle 3





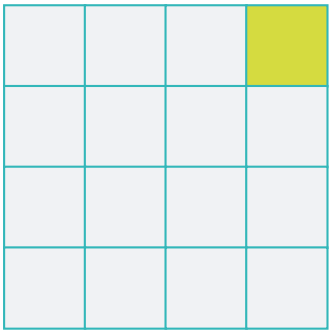




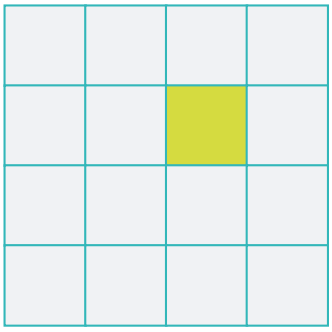


**Arrange the pieces so that they cover all the grey squares, but not the green squares. Each puzzle has four pieces, but you will only need three. Which piece is leftover?**

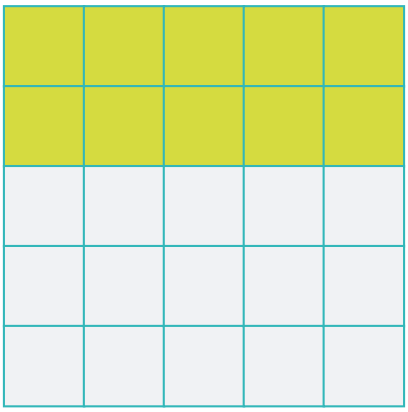
## Puzzle 1



## Puzzle 2



## Puzzle 3





Send your favourite pictures to CLDteam@gsc.org.uk or share with us @TheBothyGSC on Twitter.

**Can you create your own pentomino shapes and puzzles?**



# Create a Kaleidoscope

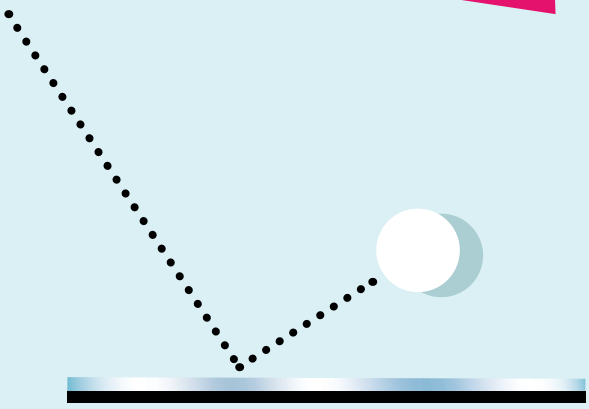
A kaleidoscope is a tube which has mirrors on the inside and lots of colourful little objects such as beads at one end. When you look through it you see beautiful patterns that change as you rotate the tube.



**The symmetrical patterns you see as you rotate a kaleidoscope are created by light hitting the mirrors inside the tube.**

Imagine light as a ball travelling in a straight line. Usually when light hits an object the object absorbs the ball of light, but when it hits a mirror, the ball bounces back and you see a reflection.

A kaleidoscope has two or more mirrors which bounce light back and forth creating reflections of the colourful beads inside.



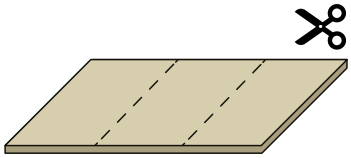

**Next time you visit Glasgow Science Centre, try our Infinity Mirror exhibit and put yourself in a kaleidoscope!**

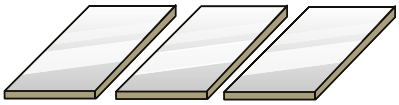


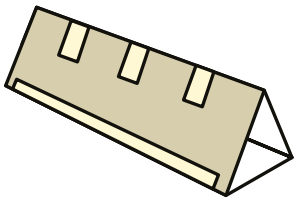
# Make your own **Kaleidoscope**

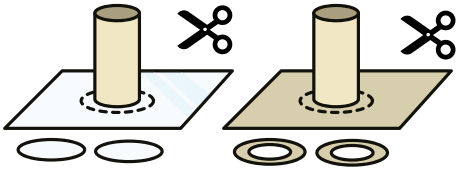
## What will you need?

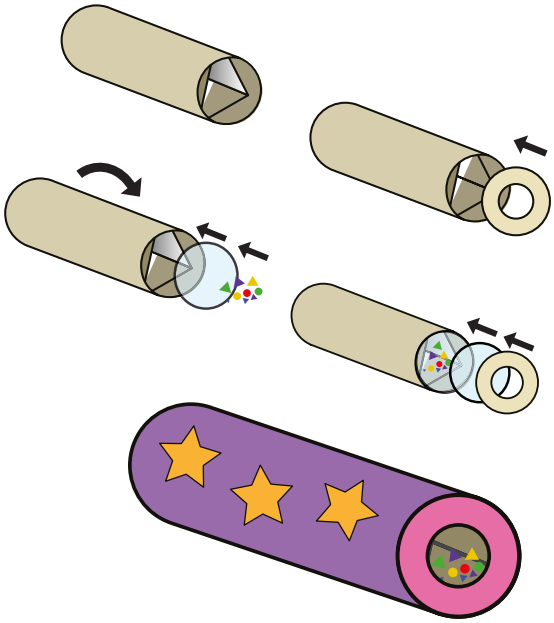
- Thin cardboard (cereal box cardboard is perfect!)
- Toilet roll tube
- Aluminium foil
- Clear plastic (can be cut from recycled bottles or lids)
- Sequins, little beads or any tiny 'colourful things you already have
- Glue
- Sticky tape
- Scissors
- Coloured paper and pens to decorate











## What to do

**Step 1.** Cut the cardboard into three strips that are 3 cm wide and about 1 cm shorter than the tube you're using.

**Step 2.** Cover one side of each strip with aluminium foil by gluing it on.

**Step 3.** Make a prism or 'triangular tube' with the three cardboard strips so that the aluminium sides face inwards and secure with tape. This will be your mirrored prism that will reflect the light.

**Step 4.** Trace around the circumference of your tube, twice onto the clear plastic and twice onto the cardboard. Cut out these four circles.

**Step 5.** Cut a 1 cm hole in the centre of the cardboard circles so you can look through.

**Step 6.** Put the prism into your paper tube.

**Step 7.** Secure one cardboard circle onto one end of the tube using tape.

**Step 8.** Put the clear plastic circle inside the other end, making sure it lays flat on top of the prism, you might need to trim the circle a little to make it fit.

**Step 9.** Put your beads/sequins on top, enough to roughly cover the plastic surface.

**Step 10.** Take your second cardboard circle and glue it onto the remaining plastic circle. Tape this to the end of the tube to seal the beads inside.

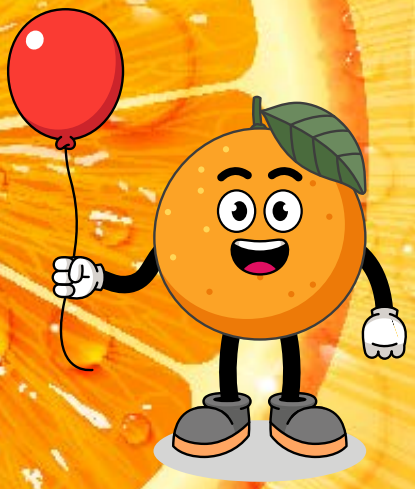
**Step 11.** Last, but not least, decorate your kaleidoscope however you want!

**To use your kaleidoscope, point the end with your beads towards a source of light and look through the other end. The light will enter in through the hole and bounce around your mirrored prism creating amazing patterns!**

DID YOU KNOW?

**The first kaleidoscope was invented by Scottish physicist David Brewster in 1816 while he was studying the science of light.**

# A-peel-ing Science



## What's inside an orange peel?

Orange peel contains lots of nutrients and also an oily compound called Limonene. Limonene helps keep oranges safe from insects and gives them their unique smell. We use limonene for cleaning products and perfumes. Limonene can also dissolve rubber! Try our experiment below to see for yourself.

### What will you need?

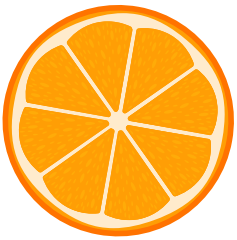
- An orange
- Two inflated rubber balloons

### What to do

**Step 1.** Remove the peel from your orange. Keep the peel and put the inside of the orange in the fridge so you can eat it later!

**Step 2.** Squeeze some of the peel and allow the liquid to land on one of the inflated balloons. What happens?

**Step 3.** Try rubbing some of the fresh peel onto one of your fingers, so that your finger is coated with the liquid from the orange peel. Now touch the remaining inflated balloon with your finger. What happens this time?



**DID YOU KNOW?**

**A single orange can provide most of your daily allowance of Vitamin C. Vitamin C helps keep your skin, blood vessels, bones, and even your cells healthy!**

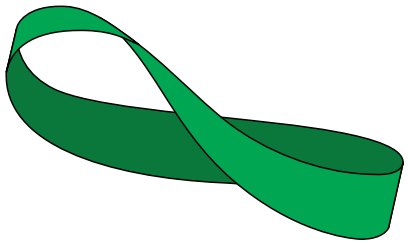
SCAN ME

**Prefer to follow along using a video?**

**Use the QR code on the left to watch Stocking Filler Science, which is packed with many fun experiments and demonstrations!**



# Make A Merry Möbius Paper Chain!



## What will you need?

- Strips of paper 2 cm wide
- Coloured pens or pencils
- Sticky tape
- Scissors

Share your creations with us on twitter @GSC1

## What to do

**Step 1.** Take a strip of paper and colour in each side.

**Step 2.** Curve the two ends of the paper together to create a loop.

**Step 3.** Twist one of the ends so the two different colours meet.

**Step 4.** Stick the ends together using sticky tape.

## You have now made a Möbius strip! But what's so special about it?

Pinch your Möbius strip between your finger and thumb and then begin to run the strip through your fingers. Look at the colours on the paper as it passes through your fingers. It seems that where the two sides were separate, they are now both on the same side.

Now draw a line down the middle of your Möbius strip. Was this line longer than you expected?

## What happens if you cut down the line you just drew?



Try making more Möbius strips and join them together into a paper chain decoration for the holidays.

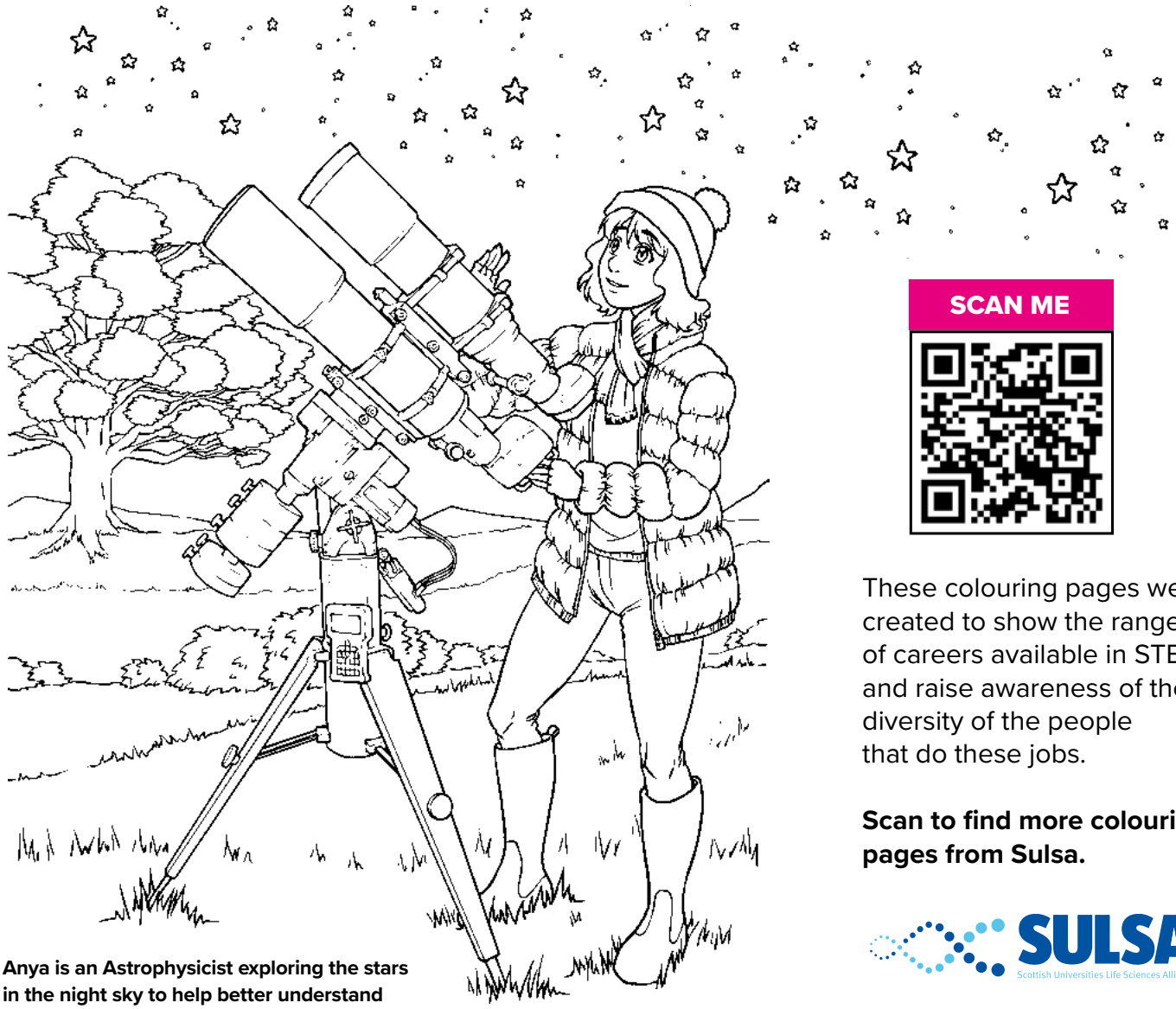


# STEM-tastic Jobs

Colour in these pictures and find out about different jobs in science. What do you want to be when you grow up?




**Fatima is an Ambulance Paramedic and responds to emergency calls giving lifesaving medical help.**



**Anya is an Astrophysicist exploring the stars in the night sky to help better understand the universe and our solar system.**

**SCAN ME**

These colouring pages were created to show the range of careers available in STEM and raise awareness of the diversity of the people that do these jobs.

**Scan to find more colouring pages from Sulsa.**

SULSA
Scottish Universities Life Sciences Alliance

## Meet an Education, Outreach and Diversity Officer for the Royal Astronomical Society

### My name is Sheila Kanani

Because I work in outreach, my job is really varied. I can be found teaching GCSE Astronomy, giving a public talk, speaking on live TV or radio, writing a book about space, or talking to school children about careers in the space industry.

When I was little, I wanted to be a vet because I love animals. When I was 13, I wanted to be an astronaut, and the thought of going into space has inspired me to get to where I am today. I work to make sure the astronomy and space industry is diverse and varied. That means I encourage anyone to join us. I believe anybody can be an astronomer or a space scientist if they want to be. I hope I am making the world a better place by inspiring people to love space! I love that I meet lots of different people, from school children to astronauts!

Everyone I meet is interesting and helps me see the world in a different way. I use lots of different skills to do my job – from speaking to large audiences to designing educational posters – every day is different.



**My favourite food is curry.**

**My hobby is embroidery.**



**My party trick is that I can write backwards in mirror image.**

# BRIGHT SPARKS!

Are you a bright spark? Test your knowledge with our tricky questions! Check your answers on the back page.

**1** Which planet in our solar system is the closest to the Sun?

- A) Neptune
- B) Saturn
- C) Mercury

**2** Which vehicle is driven by a paramedic?

- A) Police car
- B) Ambulance
- C) Ice cream van

**3** Which of these substances gives oranges their smell?

- A) Benzene
- B) Limonene
- C) Orangene

**4** Which of these organisms is NOT studied by microbiologists?

- A) Insects
- B) Bacteria
- C) Fungi

**5** Where can the aurora borealis be seen?

- A) Northern Hemisphere
- B) The equator
- C) Southern Hemisphere

**6** David Brewster, the scientist who invented the kaleidoscope, was from which country?

- A) France
- B) England
- C) Scotland

**7** What is the name of the thick layer of fat that keeps dolphins, porpoises, and seals warm?

- A) Flubber
- B) Blubber
- C) Dubber

**8** Which of these constellations can only be seen from Scotland during winter?

- A) Ursa Major
- B) Cassiopeia
- C) Orion

**9** What is the meaning of the word 'dinosaur'?

- A) Large monster
- B) Terrible lizard
- C) Dragon bones

**10** What is the study of the behaviour and properties of light called?

- A) Optics
- B) Liminology
- C) Luximetry

11

What do you call an object that doesn't allow heat to easily travel through it?

- [ ] A) Insulator
- [ ] B) Insulin
- [ ] C) Insomnia

12

How far away is the Sun from Earth?

- [ ] A) 88 million kilometres
- [ ] B) 127 million kilometres
- [ ] C) 149 million kilometres

13

What does an astrophysicist study?

- [ ] A) The Earth
- [ ] B) The sea
- [ ] C) The stars

14

Earth is the only planet that has auroras.

- [ ] True
- [ ] False

15

What can limonene dissolve?

- [ ] A) Paper
- [ ] B) Rubber
- [ ] C) Stone

16

What do kaleidoscopes need to work?

- [ ] A) Sound
- [ ] B) Heat
- [ ] C) Light

17

What is the name for a group of pandas?

- [ ] A) An embarrassment
- [ ] B) A checkerboard
- [ ] C) A fluff

18

What are baby puffins called?

- [ ] A) Puffthings
- [ ] B) Pufflings
- [ ] C) Puffrings

19

What is the chemical formula for water?

- [ ] A) $H_2O$
- [ ] B) HCl
- [ ] C) NaCl

20

What gas do humans need to breathe?

- [ ] A) Nitrogen
- [ ] B) Chlorine
- [ ] C) Oxygen



## ABOUT US

Glasgow Science Centre is a 5-star visitor attraction located beside the River Clyde. We are home to hundreds of interactive exhibits where you can discover how the world works.

Glasgow Science Centre is a registered Scottish charity SC030809.

For more information and bookings, visit: glasgowsciencecentre.org

## Bright Spark QUIZ ANSWERS

**Q1. C** Mercury is the closest planet to the Sun!

**Q2. B** Paramedics use ambulances to drive around and help patients requiring emergency medical help.

**Q3. B** Limonene helps gives oranges their smell and can also be used in cleaning products.

**Q4. A** Insects are too big for microbiologists! The study of insects is called entomology.

**Q5. A** If the lights are seen in the Southern Hemisphere, they are called aurora australis.

**Q6. C** David Brewster was from Jedburgh in the Scottish borders.

**Q7. B** Blubber helps keep these animals warm and also helps them stay afloat.

**Q8. C** Orion the hunter is a familiar sight on winter nights in Scotland. The other two are visible all year round!

**Q9. B** The word 'dinosaur' comes from the Greek words 'deinos' and 'sauros', which mean terrible and lizard!

**Q10. A** Optics is the study of light.

**Q11. A** An insulator doesn't allow heat to travel through it easily.

**Q12. C** The Sun is 149 million kilometres away. It takes 8 mins for the light from the Sun to reach Earth.

**Q13. C** They study the stars. In our galaxy there are over 100 thousand million stars!

**Q14. False.** Auroras have been spotted on other planets.

**Q15. B** Limonene can dissolve rubber.

**Q16. C** Kaleidoscopes need light to work.

**Q17. A** A group of pandas is called an embarrassment.

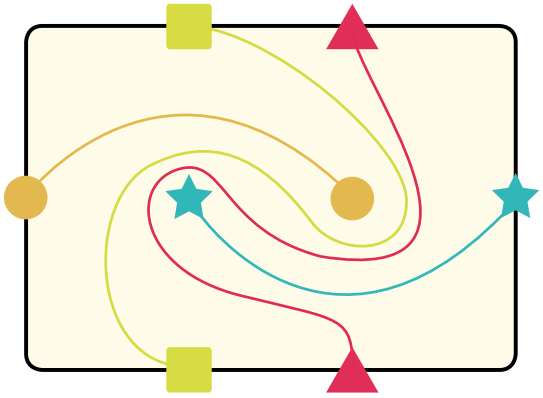
**Q18. B** Baby puffins are called pufflings.

**Q19. A** $H_2O$ is the chemical formula for water.

**Q20. C** Humans need oxygen to breathe.

## PUZZLE SOLUTIONS

### Loopy lines



### Pentominoes

**Puzzle 1**

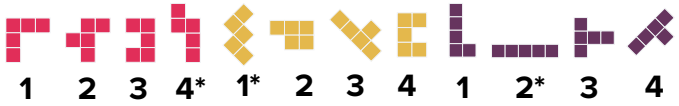
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| 1 | 2 | 3 | 3 |
| 1 | 2 | 2 | 3 |
| 2 | 2 | 3 | 3 |

**Puzzle 2**

| | | | |
|---|---|---|---|
| 3 | 4 | 4 | 4 |
| 3 | 4 | | 4 |
| 3 | 3 | 2 | 2 |
| 3 | 2 | 2 | 2 |

**Puzzle 3**

| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| 3 | 4 | 4 | 4 | 4 |
| 3 | 3 | 3 | 4 | 1 |
| 3 | 1 | 1 | 1 | 1 |

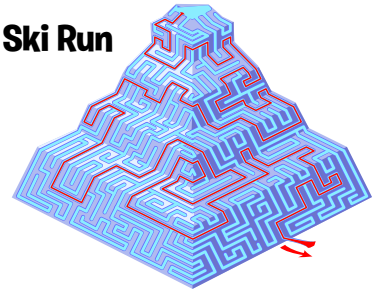



*Shape not used.

### Ten to Five




### Ski Run



**WE WANT YOUR FEEDBACK**

**We would love to hear what you think!**

We hope you liked this issue, but if you didn't, what could we change? What other things would you like to see? What topics are you most interested in?

You can send feedback and pictures to CLDteam@GSC.org.uk or message us on Twitter @TheBothyGSC


**KEEP IN TOUCH**

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