YOUR SCIENCE ONLINE

Ages 8–11

# Christmas Science Pack

Advent calendar · festive experiments · puzzles
badges · certificate · answers




**This pack belongs to:** _____

| | What's inside | Page |
|---|---|---|
| 1 | **Science Advent Calendar** – 24 mini activities, 1–24 December | 2 |
| 2 | **Festive Experiments** – 5 experiments with record sheets | 3 |
| 3 | **The Science of Christmas** – fun facts & thinking questions | 8 |
| 4 | **Christmas Puzzles** – word search, crossword, code breaker | 10 |
| 5 | **Science Star Badges** to colour & cut out + **Certificate** | 13–14 |
| 6 | **Answers** (for grown-ups) | 15 |

### How to use this pack

- Do one Advent activity each day from 1 December.
- Pick any experiment – each takes 15–30 minutes.
- Predict, test and explain on the record sheets.
- Perfect for home, homeschool or the last week of term.

### Safety first

- Activities marked **ADULT HELP** need a grown-up.
- Never taste experiments unless the sheet says it is safe.
- Use warm water, never hot water from the kettle.
- Wash hands and tidy up after every experiment.

**Love this pack?** Find more free science activities at **yourscienceonline.com**

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# 1 Science Advent Calendar

❄ 24 days of mini science

Do one activity each day from **1 to 24 December** and tick **Done** when you finish. Most activities use things you already have at home.

### 1 Ice or snow?
Crush some ice in a bag. Why does crushed ice look white when an ice cube looks clear?

Done ☐

### 2 Salty melt
Put an ice cube on two plates. Sprinkle salt on one. Which melts first? Why do we salt icy roads?

Done ☐

### 3 Pine needles
Look closely at a pine needle. Why is it thin and waxy? Hint: it helps the tree save water in winter.

Done ☐

### 4 Dancing raisins
Drop 5 raisins into a glass of fizzy water. Watch them rise and sink. What lifts them up?

Done ☐

### 5 Candy cane race
Put one candy cane in warm water and one in cold water. Which dissolves faster?

Done ☐

### 6 Static snow
Rub a balloon on your hair. Hold it over tiny paper snowflakes. What happens?

Done ☐

### 7 Reindeer eyes
Reindeer eyes turn from gold in summer to blue in winter to see in the dark. Find another animal whose eyes glow at night.

Done ☐

### 8 Jingle bells
Ring a bell. Now hold it tightly and ring it again. What changed? Sound is made by vibrations!

Done ☐

### 9 Frosty can
Fill a tin can with ice and salt and stir. Watch frost appear on the outside. Where did the water come from?

ADULT HELP

Done ☐

### 10 Shadow reindeer
Make a reindeer shadow with a torch (flashlight). Move the torch closer. What happens to the shadow?

Done ☐

### 11 Orange float
Put an orange in water. Now peel it and try again. Which one floats? Why?

Done ☐

### 12 Magnet hunt
Test your Christmas decorations with a fridge magnet. Which ones are magnetic? Make a list.

Done ☐

### 13 Gingerbread gas
Baking soda makes bubbles of gas when biscuits bake. Which gas is it? Hint: we breathe it out.

Done ☐

### 14 Warm spoons
Stand a metal spoon and a wooden spoon in warm water. After 2 minutes, touch the handles. Which is warmer?

ADULT HELP

Done ☐

### 15 Woolly robin
Robins fluff up their feathers to keep warm. Wrap one ice cube in a sock. Which ice cube melts slower?

Done ☐

### 16 Evening star
Look for the brightest "star" after sunset. It may be a planet! Find out which one.

Done ☐

### 17 Snow lava lamp
Oil, water, food colouring and a fizzy tablet in a bottle. Watch the blobs go up and down!

ADULT HELP

Done ☐

### 18 Six-sided snow
Fold and cut a paper snowflake. Real snowflakes have 6 sides – how many does yours have?

Done ☐

### 19 Holly test
Drip water on a holly leaf. Why does the water roll off? Look for the shiny, waxy layer.

Done ☐

### 20 Sleigh rocket
Tape a balloon to a straw on a string. Let it go! Air rushes back, the balloon zooms forward.

Done ☐

### 21 Snow globe
Drop glitter into water, then into water with syrup. In which does the "snow" fall slower?

Done ☐

### 22 Hot chocolate
Does sugar dissolve faster in warm milk or cold milk? Make a prediction, then test it.

ADULT HELP

Done ☐

### 23 Santa's maths
If Santa visits 1 house every second, how many houses can he visit in 1 hour?

Done ☐

### 24 Big question
Write down a science question you still wonder about. Find the answer in January!

Done ☐

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## 2 Experiment 1: Candy Cane Race

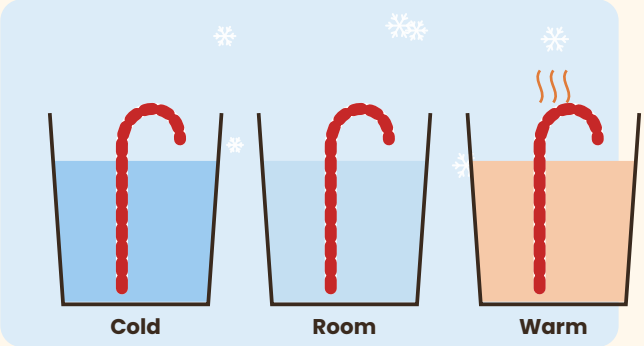
Dissolving

**Science question:** Which candy cane will dissolve fastest: in cold, room-temperature or warm water?

### You will need

- 3 clear cups or glasses
- 3 mini candy canes (same size)
- Cold, room-temperature and warm tap water
- A measuring jug
- A timer or clock

**ADULT HELP** needed for this experiment.




### What to do

1. Ask an adult to pour warm tap water into one cup. Fill the others with cold and room-temperature water. Use the **same amount** in each cup.
2. Write your prediction below.
3. Drop one candy cane into each cup at exactly the same time. Do not stir!
4. Look carefully after 2 minutes and after 5 minutes.
5. Record what you see and the time when each candy cane has fully dissolved.

### My prediction

I think the candy cane in the _____ water will dissolve first because...

### My results

| Water | After 2 minutes | After 5 minutes | Time to dissolve |
|---|---|---|---|
| Cold | | | |
| Room | | | |
| Warm | | | |

### What happened? Why do you think it happened?

**Science Star fact:** In warm water the particles move faster, so they knock the sugar particles away more quickly. That is why sugar dissolves faster in a hot drink!

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## 2 Experiment 2: Fizzy Snowballs

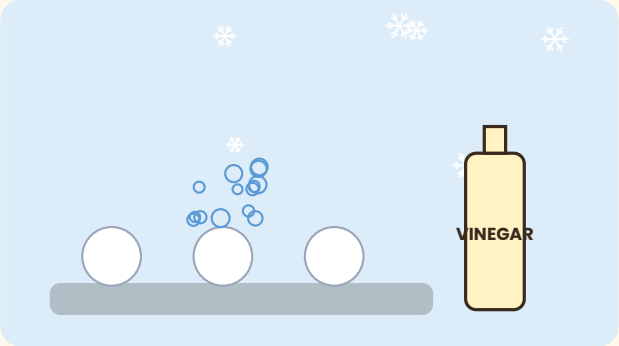
Chemical reactions

**Science question:** What happens when baking soda "snow" meets vinegar?

### You will need

- 1 cup of bicarbonate of soda (baking soda)
- 3–4 spoons of water
- A tray or baking dish
- Vinegar in a small cup
- A spoon or dropper

**ADULT HELP** needed for this experiment.




### What to do

1. Mix the baking soda with a little water, one spoon at a time, until it sticks together like snow.
2. Squeeze it into 3 small snowballs on the tray. Touch one – how does it feel?
3. Drip a **small** amount of vinegar onto snowball 1.
4. Pour a **big** spoonful of vinegar onto snowball 2.
5. Watch, listen and gently touch the fizzy snow. Keep vinegar away from your eyes and wash your hands after.

### My prediction

I think that when vinegar touches the snowball it will...

### My results

| Snowball | What I saw | What I heard | How it felt |
|---|---|---|---|
| **Small drip** | | | |
| **Big spoonful** | | | |

### What happened? Why do you think it happened?

**Science Star fact:** The fizz is a gas called carbon dioxide. This reaction takes in heat energy, so the snow feels even colder! Scientists call it an endothermic reaction.

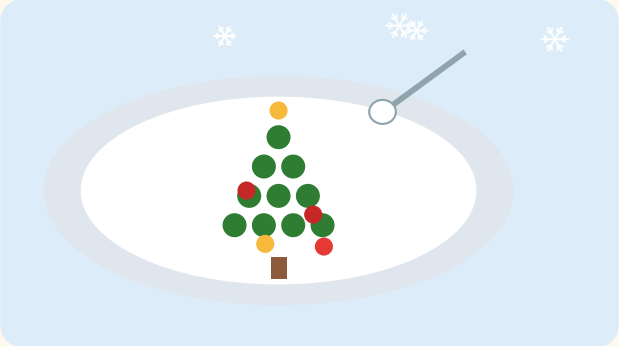
## 2 Experiment 3: Magic Milk Christmas Tree

Surface tension

**Science question:** Why do the colours swirl when soap touches the milk?

### You will need

- A shallow plate
- Full-fat milk (and skimmed milk if you have it)
- Green, red and yellow food colouring
- Cotton buds
- Washing-up liquid (dish soap)



### What to do

1. Pour milk onto the plate until the bottom is covered.
2. Add green drops in a triangle to make a tree. Add red and yellow drops for baubles.
3. Dip a cotton bud into washing-up liquid (dish soap).
4. Gently touch the middle of your tree and hold the cotton bud still. Watch!
5. Try again with skimmed milk and then with water. Compare them.

### My prediction

I think the colours will move most in the _____ because...

### My results

| Liquid | Before the soap | After the soap | How long it moved |
|---|---|---|---|
| **Full-fat milk** | | | |
| **Skimmed milk** | | | |
| **Water** | | | |

### What happened? Why do you think it happened?

**Science Star fact:** Milk has a stretchy "skin" on top called surface tension. Soap breaks it and grabs onto the fat, so the colours rush around. More fat = more swirling! Do not drink the milk afterwards.

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## 2 Experiment 4: Reindeer Parachutes

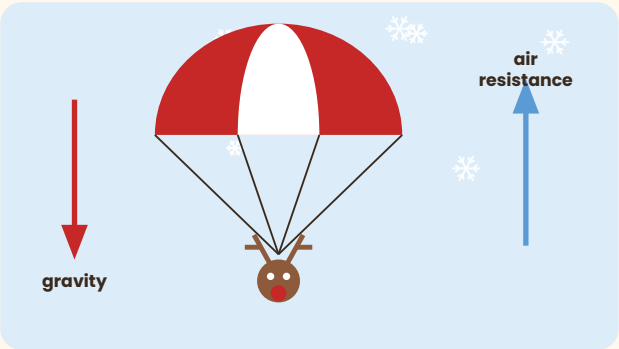
Forces

**Science question:** Does a bigger parachute make a reindeer fall more slowly?

### You will need

- A plastic bag or tissue paper
- Ruler, scissors and tape
- String or thread
- 4 paper clips and 4 small paper reindeer
- A timer and a grown-up helper

**ADULT HELP** needed for this experiment.




### What to do

1. Cut 3 squares: 10 cm, 20 cm and 30 cm wide.
2. Tape a 20 cm string to each corner. Join the strings to a paper reindeer with a paper clip.
3. Ask an adult to drop each parachute from the **same height**, e.g. the top of the stairs.
4. Time how long each one takes to land. Repeat 3 times. Drop a reindeer with no parachute too.
5. Work out the average: add the 3 times and divide by 3.

### My prediction

I think the _____ parachute will fall slowest because...

### My results

| Parachute | Trial 1 (s) | Trial 2 (s) | Trial 3 (s) | Average (s) |
|---|---|---|---|---|
| 10 cm | | | | |
| 20 cm | | | | |
| 30 cm | | | | |
| None | | | | |

### What happened? Why do you think it happened?

**Science Star fact:** Gravity pulls the reindeer down. Air pushes up on the parachute – this force is called air resistance. A bigger canopy traps more air, so it falls more slowly.

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## 2 Experiment 5: Sparkly Salt Snowflakes

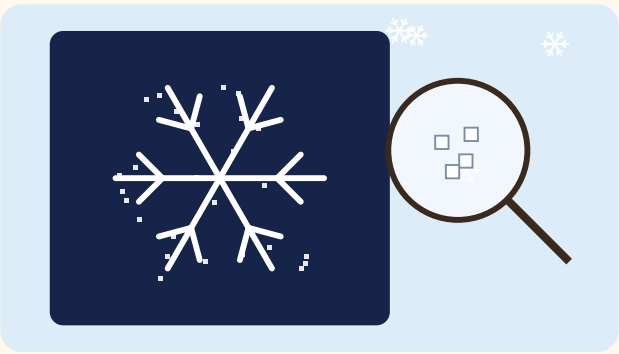
Evaporation & crystals

**Science question:** When salty water dries, where does the water go and what is left behind?

### You will need

- 3 tablespoons of salt
- Half a cup of warm tap water
- Dark blue or black card
- A paintbrush and a spoon
- A magnifying glass (if you have one)

**ADULT HELP** needed for this experiment.



### What to do

1. Ask an adult for warm water. Stir in the salt until no more will dissolve.
2. Paint a big snowflake on the dark card with the salty water.
3. Leave it flat somewhere warm overnight.
4. Look at your snowflake the next morning. What has changed?
5. Use a magnifying glass to look closely at the sparkly bits.

### My prediction

I think that by the morning my snowflake will...

.....

.....

### My results

| When | What my snowflake looks like |
|---|---|
| **Just painted** | |
| **After 1 hour** | |
| **Next morning** | |
| **Magnified** | |

### What happened? Why do you think it happened?

.....

.....

.....

**Science Star fact:** The water evaporates into the air, but the salt cannot. The salt particles join together into tiny cube-shaped crystals. Sea salt is made in the same way!

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## 3 The Science of Christmas

Fun facts to think about

Read each fact, then answer the **Think about it** question in your own words.

### 1. Why are reindeer noses so warm?

Reindeer noses are packed with tiny blood vessels. Warm blood heats the freezing Arctic air before it reaches their lungs.

**Think about it:** Why would breathing in very cold air be a problem?

### 2. Why do snowflakes have six sides?

When water freezes, its tiny particles (molecules) link up in a six-sided pattern. Each snowflake then grows in its own way as it falls.

**Think about it:** Why are no two snowflakes exactly the same?

### 3. Why is Christmas in summer in Australia?

Earth is tilted. In December the southern half of Earth leans towards the Sun, so it is summer there, while the northern half has winter.

**Think about it:** What season is it at Christmas where you live? Why?

### 4. How do Christmas lights glow?

Most fairy lights are LEDs. They turn electrical energy into light. Old bulbs wasted lots of energy as heat, but LEDs stay cool.

**Think about it:** Why are LED lights better for our planet?

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## 3 The Science of Christmas (continued)

More fun facts

### 5. Why do Christmas trees stay green?

Fir and pine trees are evergreen. Their thin, waxy needles lose very little water and are not damaged by frost, so they keep them all winter.

**Think about it:** Why do trees like oak drop their leaves in autumn?

### 6. Why do we slip on ice?

Ice has a very thin, slippery layer of water on top. This means there is very little friction between your shoes and the ground.

**Think about it:** Why do winter boots have bumpy soles?

### 7. Why does chocolate melt in your hand?

Chocolate melts at about 34 °C. Your hand is about 37 °C – warm enough to turn the solid chocolate into a liquid.

**Think about it:** Where is the best place to keep chocolate coins? Why?

### 8. How do robins keep warm?

Robins fluff up their feathers to trap a layer of air. Air is a good insulator, so it stops their body heat escaping.

**Think about it:** Which of your clothes trap air to keep you warm?

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## 4 Christmas Science Word Search

Puzzle 1 of 3

Find the 12 science words. They go **across**, **down** or **diagonally**. Tick each word when you find it.

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

| | | | |
|---|---|---|---|
| CRYSTAL | DISSOLVE | EVERGREEN | FLOAT |
| FREEZE | FRICTION | GAS | MAGNET |
| MELT | REINDEER | SNOWFLAKE | STATIC |

**Bonus:** Choose 2 of the words and use each one in a science sentence.

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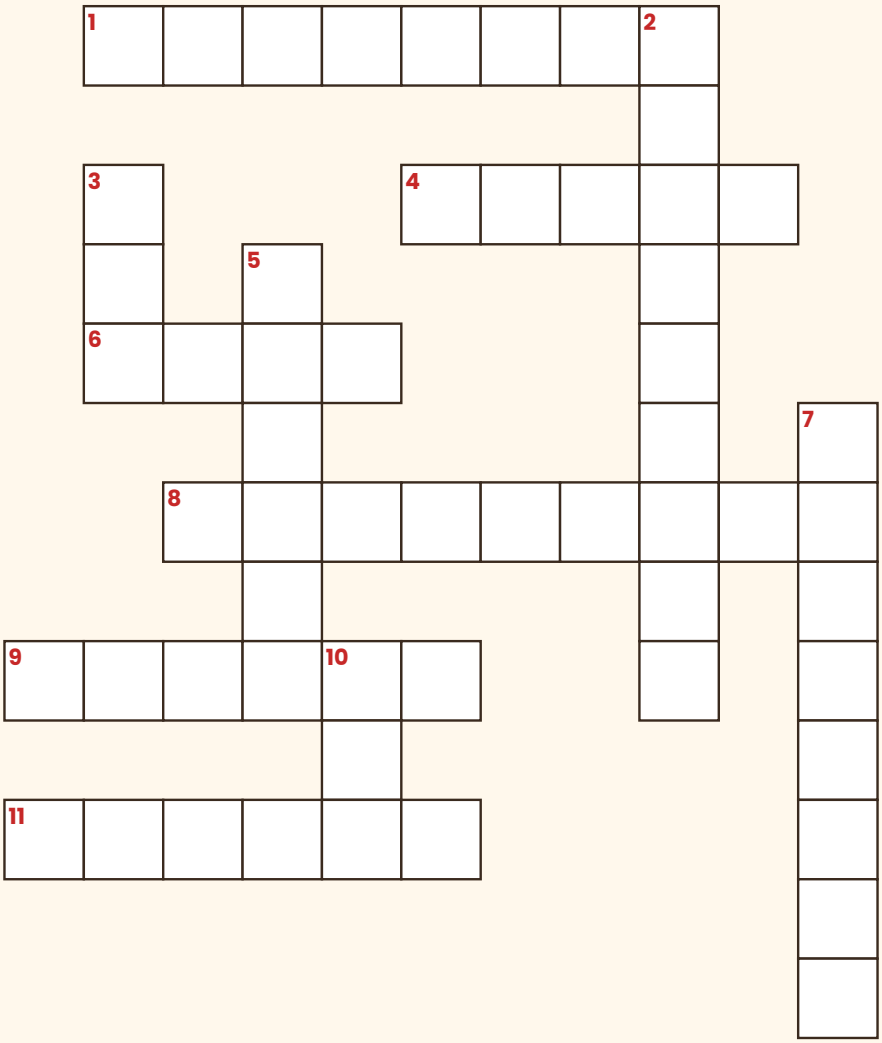
## 4 Christmas Science Crossword

Puzzle 2 of 3

Use the clues to fill in the crossword. All the answers are in this pack!




### Across

**1.** Sugar does this faster in warm water (8)
**4.** An orange with its peel will do this in water (5)
**6.** We sprinkle this on icy roads (4)
**8.** A frozen ice crystal with six sides (9)
**9.** Rub a balloon on your hair to make this electricity (6)
**11.** It attracts iron and steel (6)

### Down

**2.** Water does this to leave salt crystals behind (9)
**3.** Carbon dioxide is one (3)
**5.** The brightest "star" may really be one of these (6)
**7.** Their eyes turn blue in winter (8)
**10.** Solid water (3)

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## 4 Code Breaker: Secret Science Messages

Puzzle 3 of 3

Santa's scientists have sent secret messages! Use the code key to turn each number into a letter.

### Code key

| A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| **N** | **O** | **P** | **Q** | **R** | **S** | **T** | **U** | **V** | **W** | **X** | **Y** | **Z** |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |

### Message 1

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 14 | 15 | 23 | 6 | 12 | 1 | 11 | 5 | 19 | 8 | 1 | 22 | 5 |
| 19 | 9 | 24 | | 19 | 9 | 4 | 5 | 19 | | | | | |

### Message 2

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 5 | 9 | 14 | 4 | 5 | 5 | 18 | 3 | 1 | 14 | 19 | 5 | 5 | | | |
| 21 | 12 | 20 | 18 | 1 | 22 | 9 | 15 | 12 | 5 | 20 | 12 | 9 | 7 | 8 | 20 | |

### Unscramble the science words

**GNTAME** .....  **EZEERF** .....

**TLEM** .....  **TOFLA** .....

**YLATSRC** .....  **TCISAT** .....

## 5 Science Star Badges

Colour & cut out

Earn a badge for each challenge! Colour it in, then ask a grown-up to help you cut along the dotted line.



















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# Certificate of Christmas Science Star

This certificate is proudly awarded to

_____

for brilliant predicting, testing and explaining
in the Christmas Science Pack.

**Advent activities done:** ____ / 24
**Experiments done:** ____ / 5
**Puzzles solved:** ____ / 3

Signed _____ Date _____

SCIENCE STAR

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# 6 Answers (for grown-ups)

❄ Advent · Experiments · Facts

## Science Advent Calendar

1 Tiny ice surfaces scatter light in all directions, so it looks white.
2 The salted ice – salt lowers the temperature water freezes at.
3 Thin, waxy needles lose less water in cold, dry winters.
4 Gas bubbles stick to the raisins and lift them; they pop at the top.
5 Warm water – the particles move faster.
6 The paper jumps up – static electricity attracts it.
7 e.g. cats, foxes, owls, dogs.
8 It sounds dull – holding it stops the vibrations.
9 Water vapour in the air freezes onto the very cold can.
10 The shadow gets bigger.
11 With peel – the peel is full of air pockets.
12 Things made of iron or steel.
13 Carbon dioxide.
14 The metal spoon – metals conduct heat well.
15 The sock one – wool traps air, a good insulator.
16 Often Venus or Jupiter.
17 Gas bubbles carry coloured water up, pop, and it sinks.
18 Answers vary – real ones have 6.
19 The waxy layer is waterproof.
20 Air rushes out backwards, pushing the balloon forwards.
21 In the syrup – it is thicker.
22 Warm milk.
23 3,600 houses.
24 Answers vary.

## Festive Experiments – what should happen

- **Candy Cane Race:** warm water dissolves it fastest, then room temperature, then cold.
- **Fizzy Snowballs:** lots of bubbles and a fizzing sound; the snow feels colder. More vinegar = more fizz.
- **Magic Milk:** colours rush away from the soap and swirl. Full-fat milk swirls most; water hardly moves.
- **Reindeer Parachutes:** the 30 cm parachute falls slowest; no parachute falls fastest.
- **Salt Snowflakes:** the water evaporates and sparkly, cube-shaped salt crystals are left.

## The Science of Christmas – example answers

1 Very cold air could damage the lungs and make the reindeer lose heat.
2 Each one falls through different temperatures and amounts of water vapour.
3 Answers vary – e.g. winter in the UK, summer in Australia or New Zealand.
4 They use less energy, so less fuel is burned to make electricity.
5 Wide, thin leaves lose lots of water and get damaged by frost.
6 Bumpy soles give more friction (grip).
7 Somewhere cool, away from heaters and sunny windows.
8 e.g. woolly jumpers, fleeces, puffy coats, hats.

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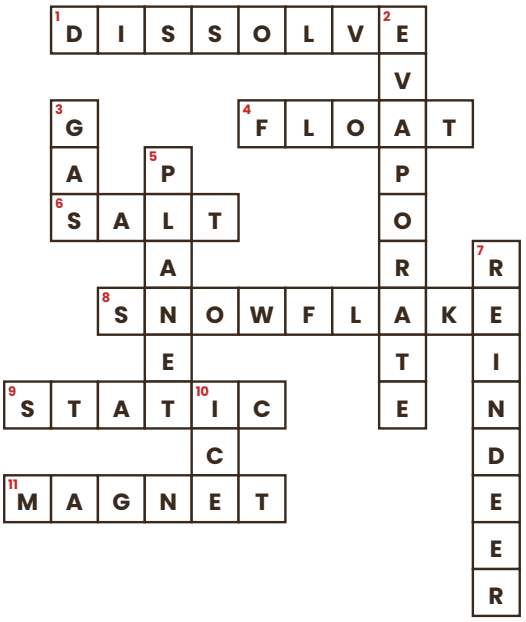
# 6 Answers: Puzzles

Word search · Crossword · Codes

## Word search

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

## Crossword




**Across:** 1 DISSOLVE, 4 FLOAT, 6 SALT, 8 SNOWFLAKE, 9 STATIC, 11 MAGNET
**Down:** 2 EVAPORATE, 3 GAS, 5 PLANET, 7 REINDEER, 10 ICE

## Code breaker

**Message 1:** Snowflakes have six sides.
**Message 2:** Reindeer can see ultraviolet light.

**Unscramble:** GNTAME = MAGNET, TLEM = MELT, YLATSRC = CRYSTAL, EZEERF = FREEZE, TOFLA = FLOAT, TCISAT = STATIC

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