The BRAIN

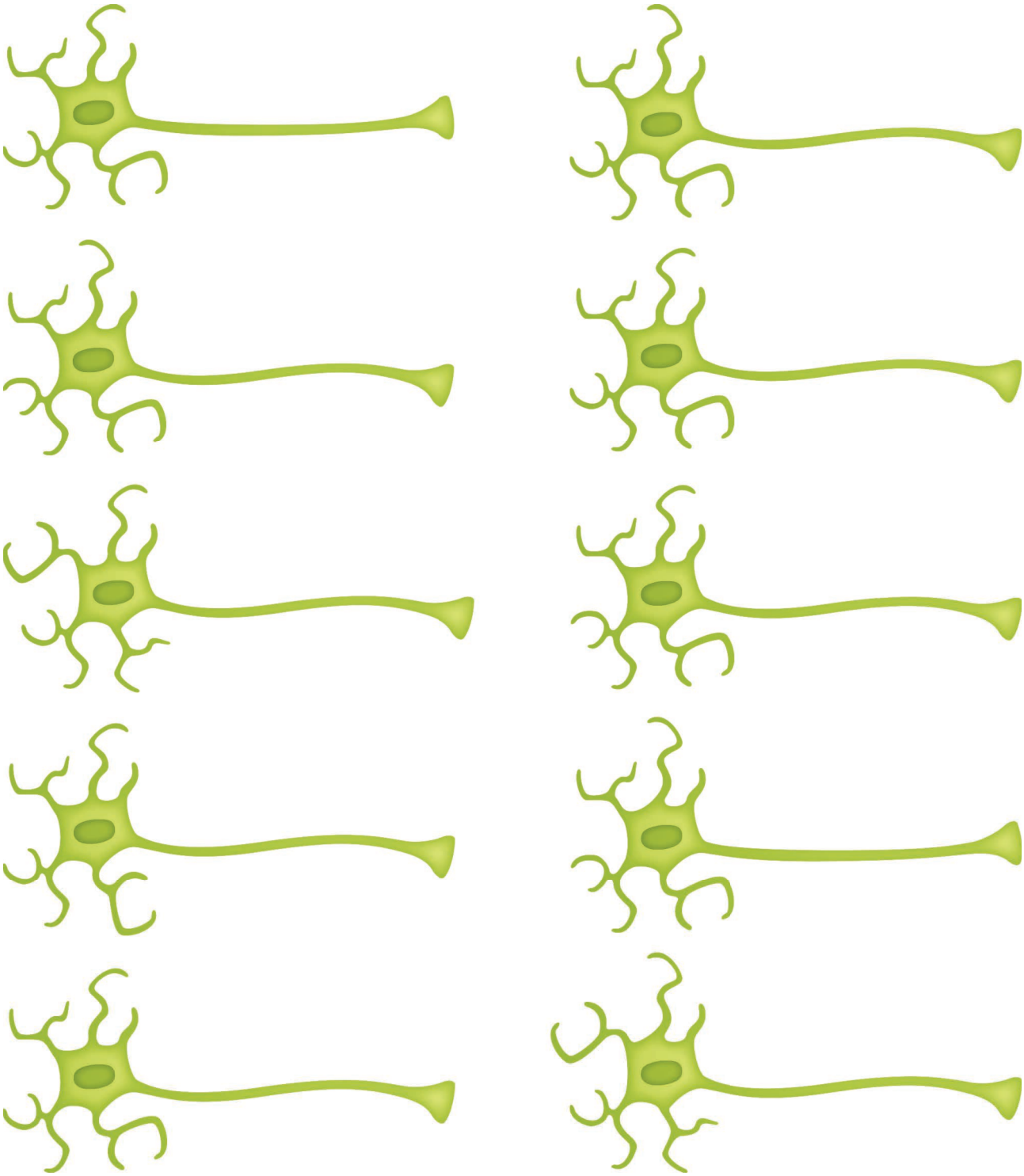
ACTIVITY BOOKLET

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
CREATE CHANGE

brought to you by the **Queensland Brain Institute**
at **The University of Queensland**
designed by Nick Valmas

Same brain but different

The nervous system has approximately 100 billion neurons, which come in many shapes and sizes. Below there are only ten, but which two are exactly the same?



For clues and answers to the puzzles visit:
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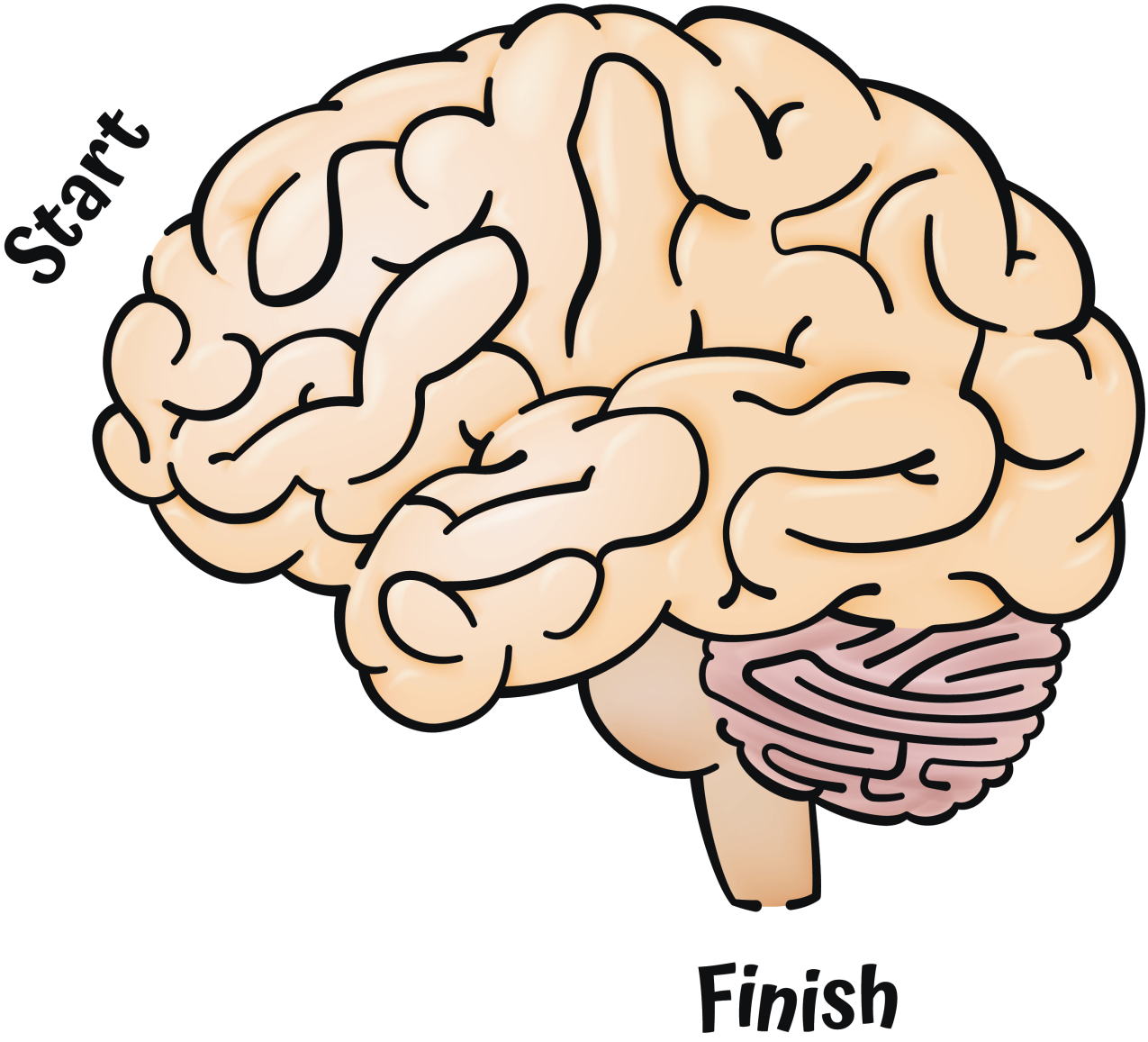
Your a-maze-ing brain

Can you navigate the sulci and gyri while exploring a brain to find a path from the start to the finish?



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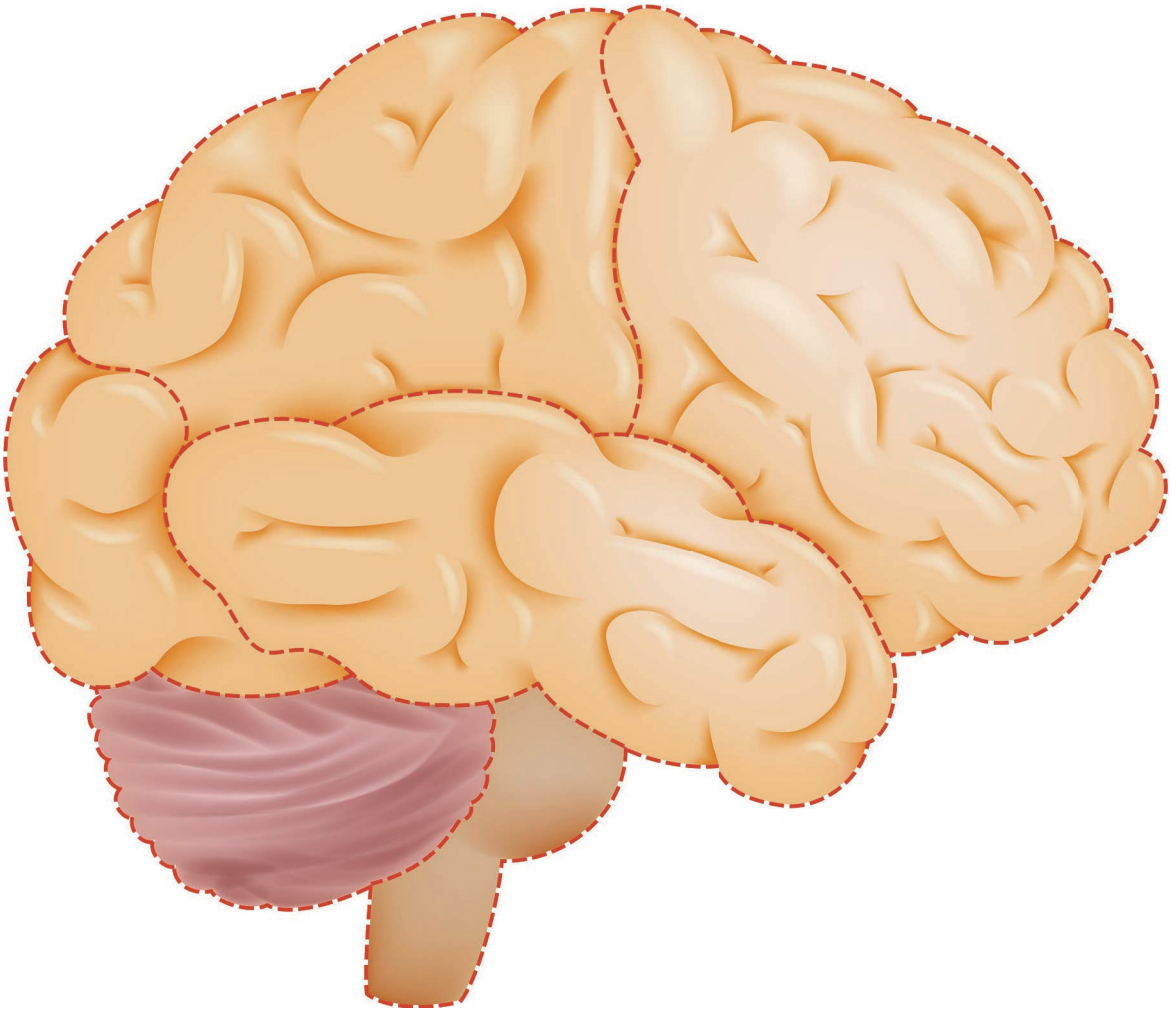
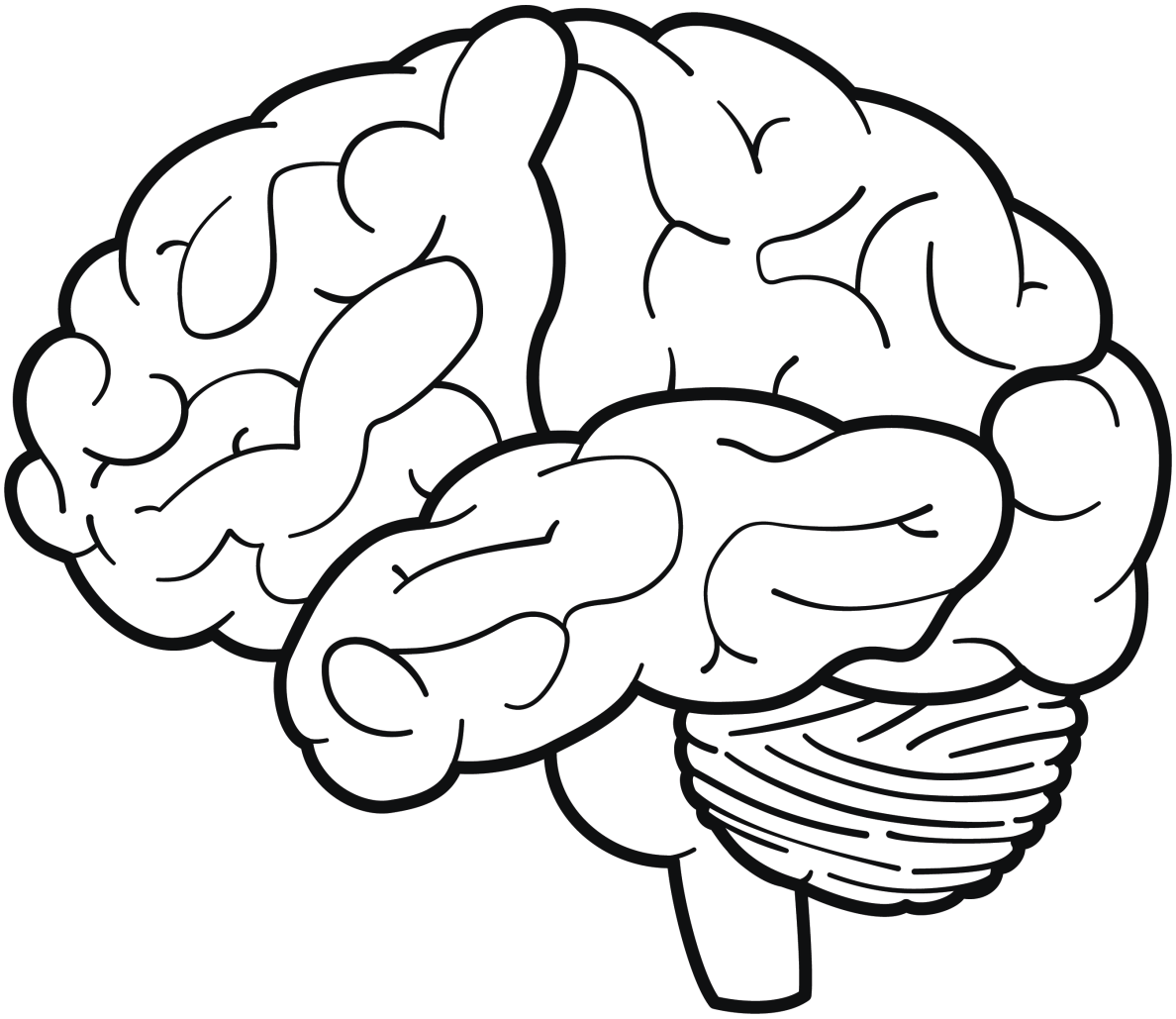
Brain in pieces

Do all the parts of the brain look the same?
Cut out the brain below along the dotted lines,
and see if you can put it back together again.



Colour by function

The functions of six different brain regions are given below. Colour the brain below according to their functions.



Occipital lobe

combines visual images and visual recognition of objects and shapes

Parietal lobe

understanding grammar, using speech and word organisation

Brain stem

forms the connection between the brain and the spinal cord, maintains vital control of the heart and lungs, and coordinates many important reflexes.

Cerebellum

involved in controlling cognitive functions; shaping your personality, feelings, and perceptions; and handling motor functions and sensory interpretation.

Frontal lobe

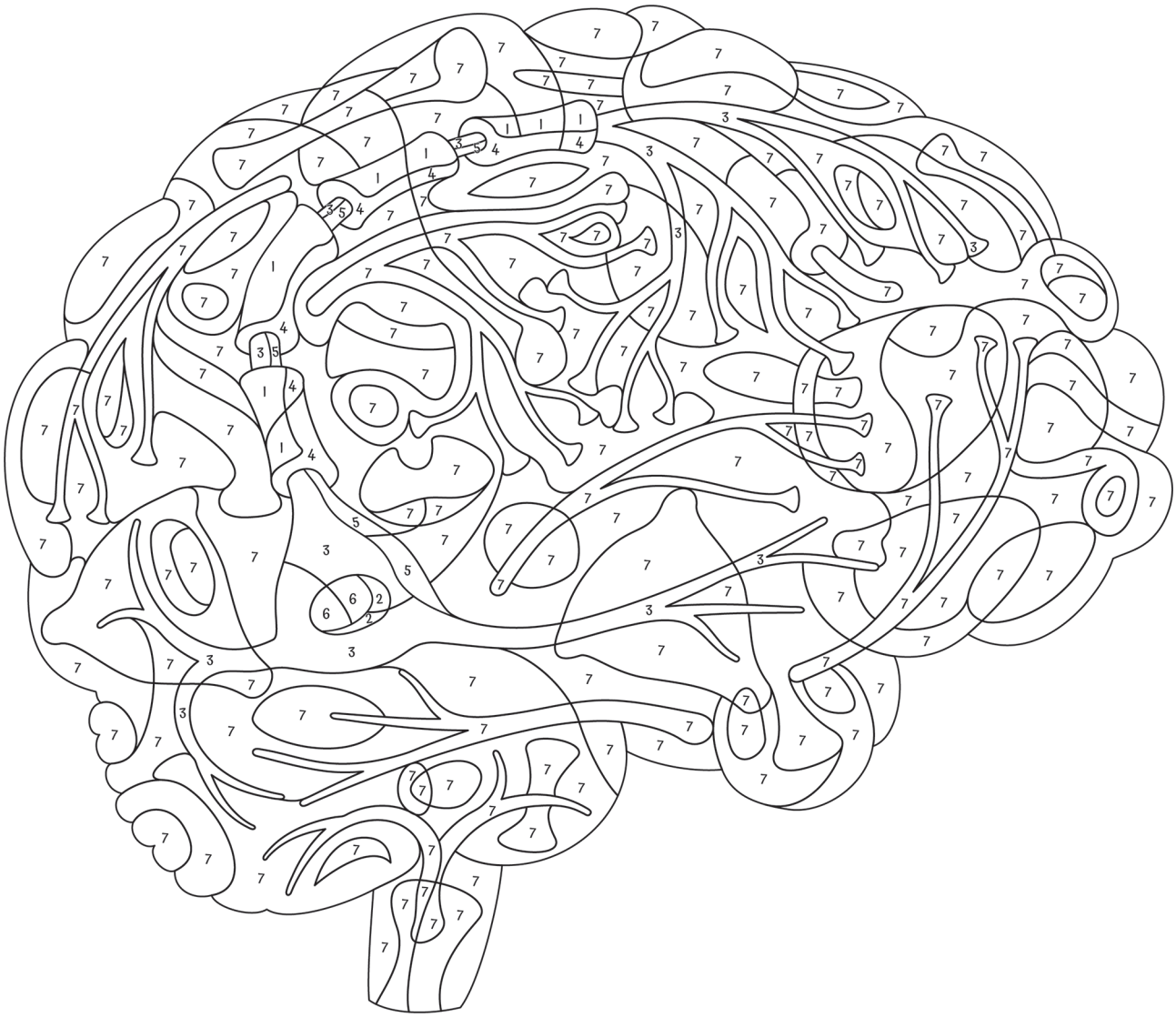
concentration, problem-solving, cognition, planning

Temporal lobe

sensory interpretation, memory of visual and auditory patterns

Colour by cells

The human body is made up of trillions of cells. Use the same colour to fill in the cells with the same number to find the hidden neuron.



Colour palette:

1 2 3 4 5 6 7

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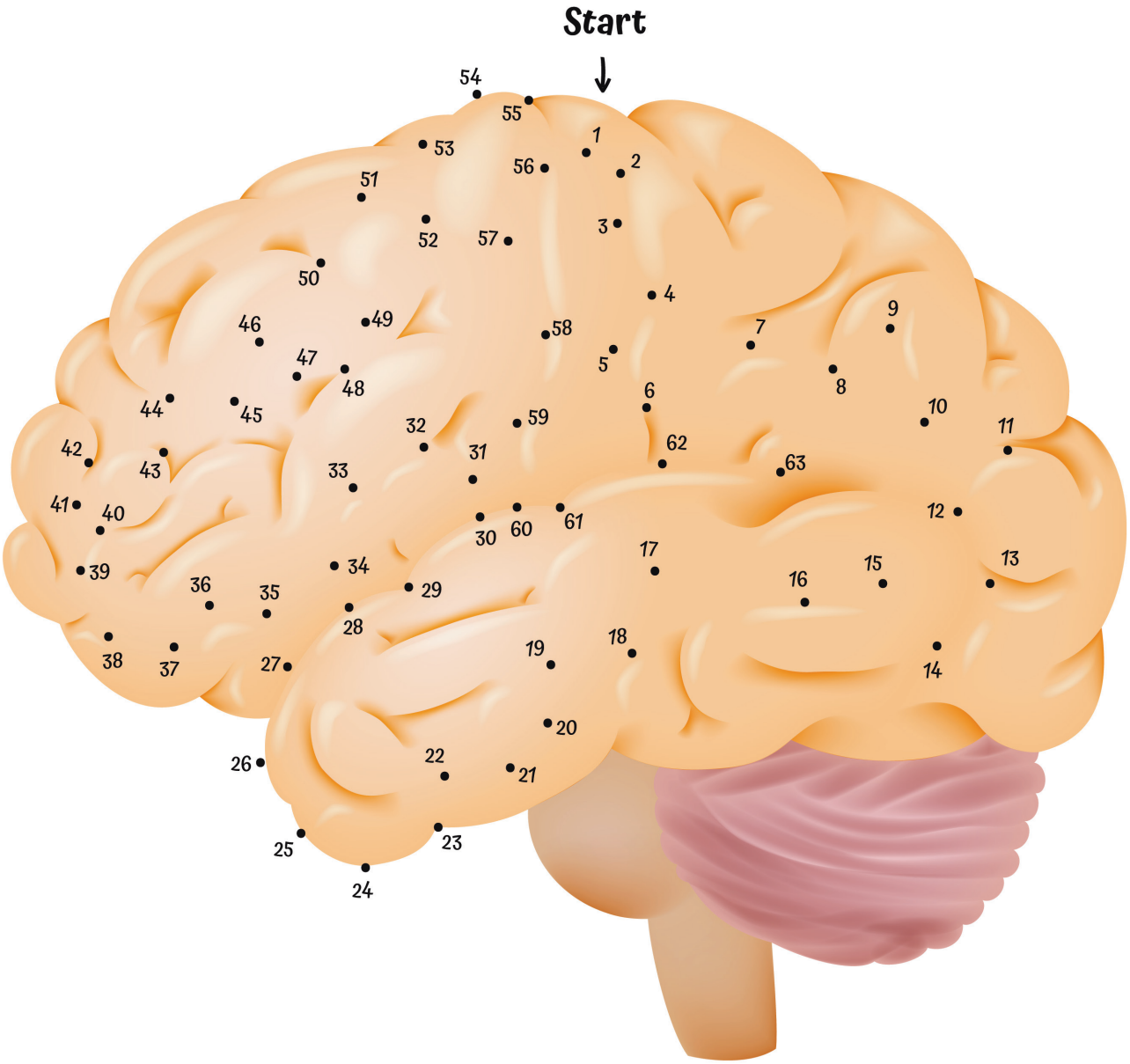
Wrinkle the brain

This brain is missing some of the important sulci and gyri that it needs to work properly. Join the dots in order to restore its wrinkle and function.



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Colour overload

Are you tired of seeing the same colours wherever you look? Try this experiment to fool your brain into seeing colours a different way

Background

Humans are highly visual animals, constantly using their eyes to make decisions about the world.

In the human eye, light entering the eye is focused by the lens onto the retina located at the back. Receptors there detect the energy and by a process of transduction initiate action potentials that travel in the optic nerve.

The most numerous photo receptors, called rods, are about 1000 times more sensitive to light than the other, less numerous category called cones. Generally speaking, you see at night with your rods but by day with your cones. There are three types of cones, sensitive to different wavelengths of light. It is an oversimplification to say cones produce colour vision but they are vital for it.

If over-exposed to one colour of light, the pigments in the cones adapt and then make a lesser contribution to our perception of colour for a short while afterwards.

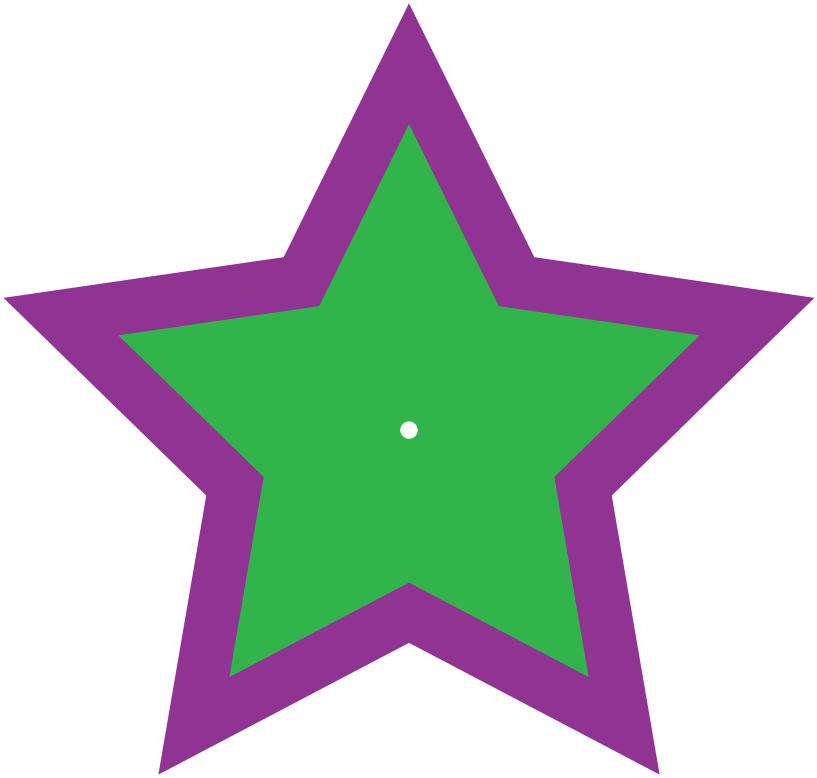
Experiment

1. Stare at the pink and blue star on the opposite page for at least 20 seconds without blinking. Focus on the white dot in its centre.

2. Immediately look below at the white page and focus on the black dot there.

3. What do you see?

Can you explain what is happening?



Brain scramble

Can you unscramble each of the neuroscience-related words below?

RUNONE

PICHPAUPOMS

BELEMURCLE

ENPASSY

LISPAN DROC

XANO

NIMLEY

ENTRIDED

SPORCU LUCOSMAL

NIRAB

EXTORC

GAMALADY

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Brain hemisphere hat

You'll need:

1. a photocopy of the two pages overleaf on cardboard
2. scissors
3. clear tape
4. glue stick

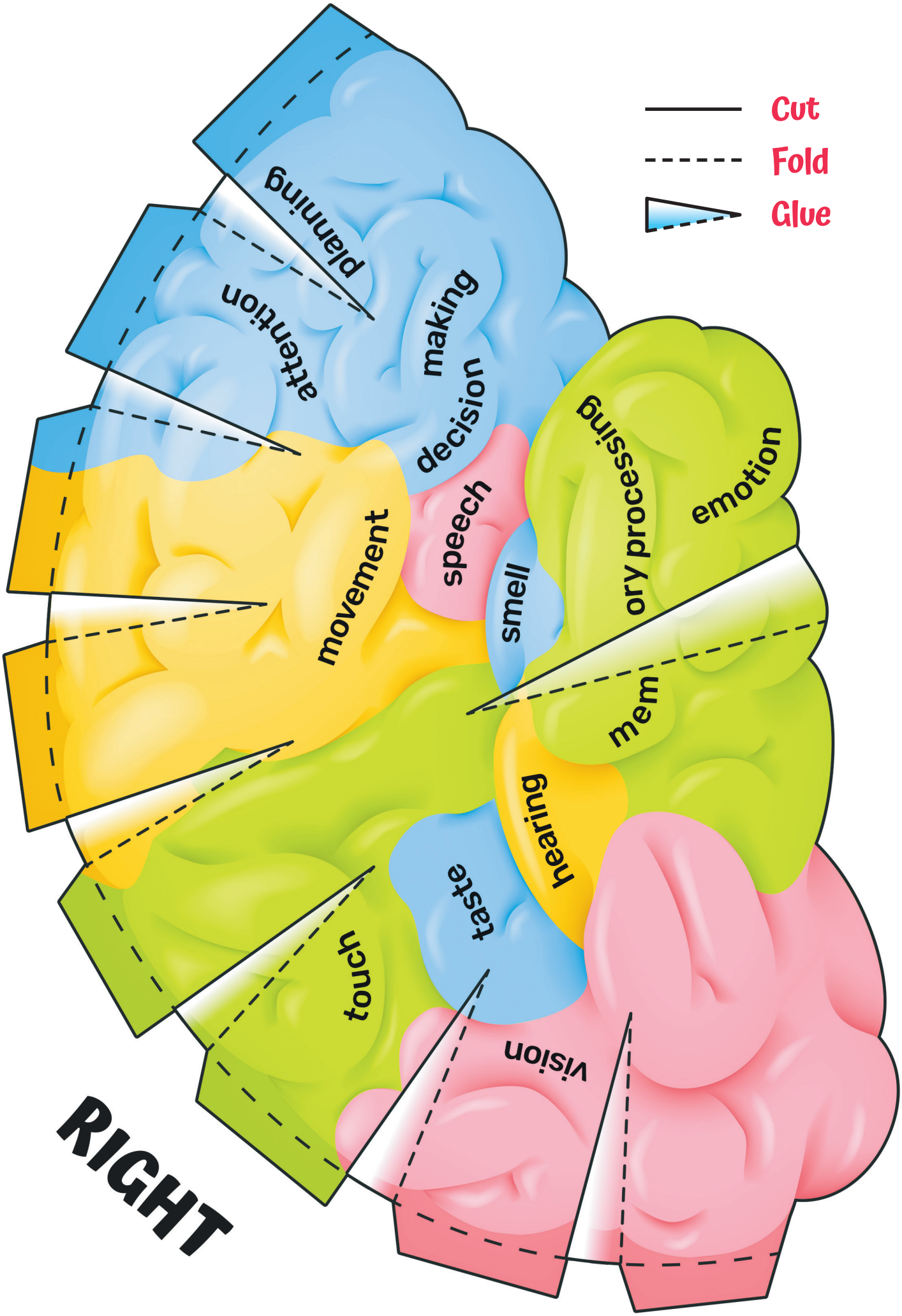
How to assemble:

1. Cut out both hemispheres along the solid black lines, including the lines that go into the hemispheres.
Don't cut the dashed lines!

2. For each hemisphere, pull the flaps you have cut over each other, so that the solid lines align with dashed lines. Secure them with glue or tape.
The hemispheres should start to curve into bowl shapes.

3. Put the two halves together, aligning the left hemisphere with the dashed line on the right hemisphere. Secure the tabs on the right hemisphere to the left hemisphere with glue or tape.

4. **Your Brain hemisphere hat is now ready to wear!**



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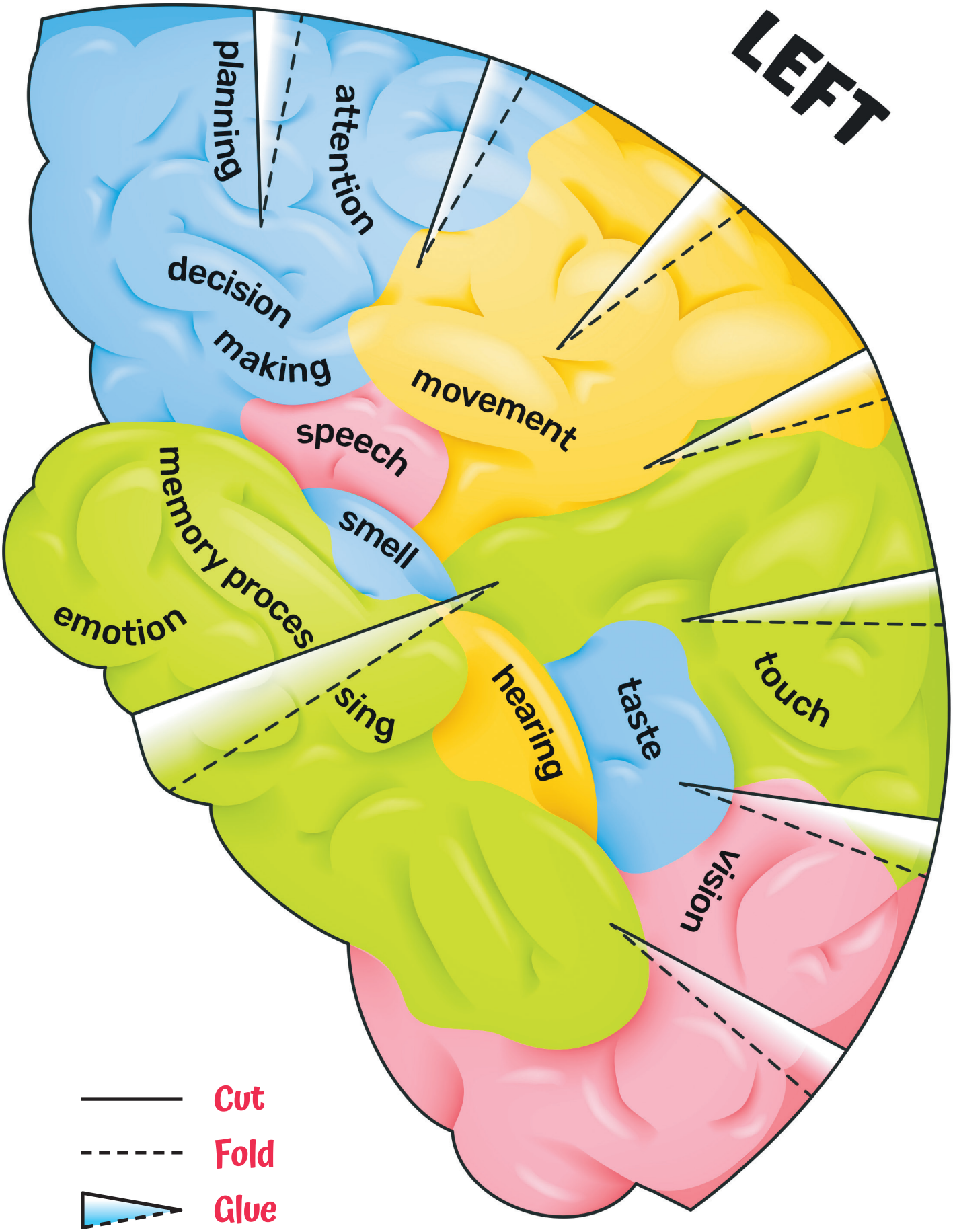

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Neuro match

Eight neuroscience terms have been jumbled up along with their definitions. Match the left half (blue) of the word with the right half (green), and its definition (red).

Hippo	apse	Junction between 2 neurons where there is a small gap that neurotransmitters help nerve impulses to cross.
Neurotr	on	Messenger of neurological information from one cell to another
Syn	ansmitter	Conduct electrical messages to the neuron cell body for the cell to function
Den	campus	The production of new neurons
Neu	drite	Responsible for processing of long term memory and emotional responses
Ax	rogenesis	Carries an electrical signal from the cell body (soma) to the synapse

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Colour confusion

Say the colours of the words as fast as you can (don't read each word). How fast can you say them? It's more difficult than it looks. Why is it so hard?

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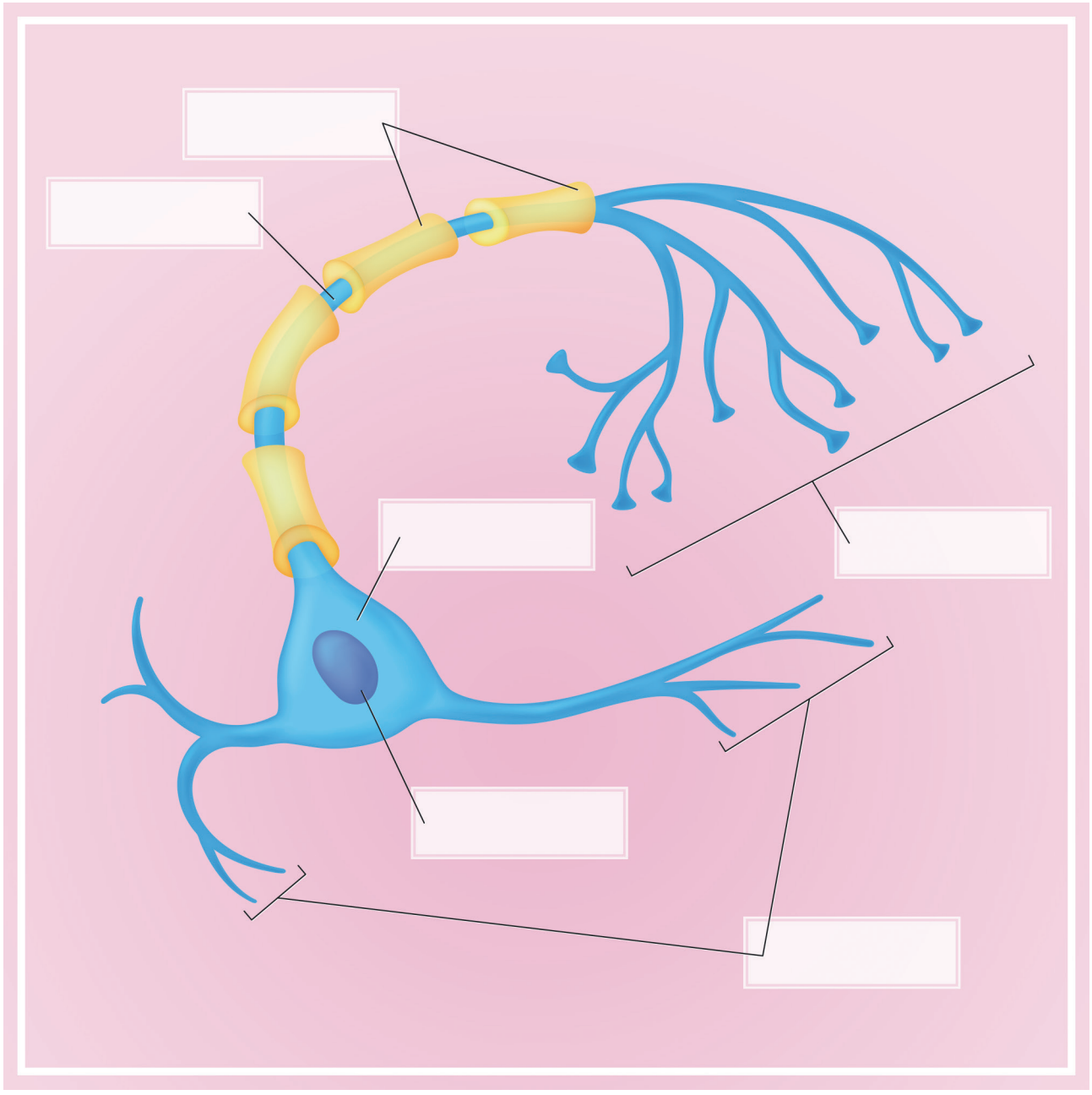
What's that part?

How well do you know your nerves?
Label parts of the neuron below using the list of features.



Neuron features:

axon	axon terminals	cell body
dendrites	myelin sheath	nucleus

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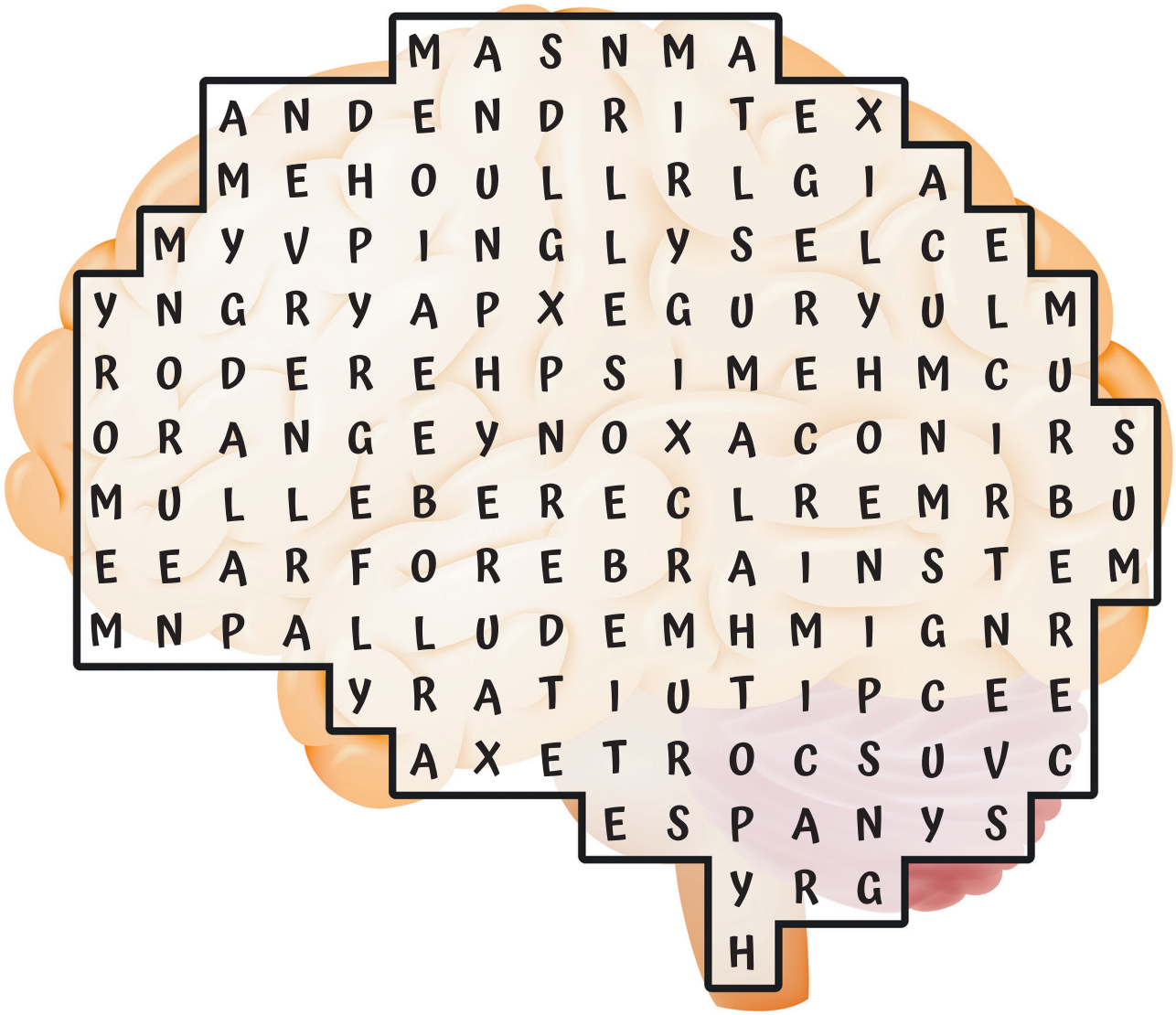
Brain search

Can you find all the brain-related words below?
They can be horizontal, vertical, diagonal and/or backwards.



Word list:

amygdala	cortex	hemisphere	memory	pons
axon	dendrite	hippocampus	myelin	spine
brainstem	forebrain	hypothalamus	nerve	sulci
cerebellum	glia	lobe	neuron	synapse
cerebrum	gyri	medulla	pituitary	ventricle

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How sensitive are you?

Are your lips more sensitive than your fingertips?
Is the skin on your legs as sensitive as the skin on your arms?
Find out by trying this two-point discrimination experiment.

Background

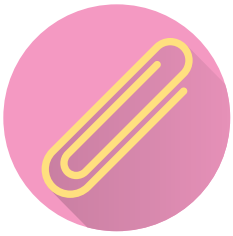
All over your body you have tiny pressure sensors in your skin. Some areas have many pressure sensors and other areas have relatively few. Areas where the pressure sensors are packed in are very sensitive to touch.

This experiment allows you to find out which parts of your skin have many pressure sensors, and where they are relatively scarce. The experiment involves gently pressing two points of a paper clip onto someone's skin and asking them whether they can feel one or two pressure points.

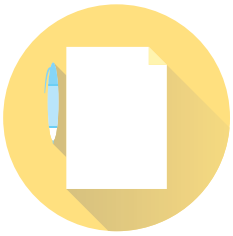
In sensitive areas, the pressure sensors are closer together, so the two tips of the paper clip will activate two separate pressure points. Messages from both sensors are sent to your brain and you feel both tips.

In less sensitive areas, the pressure sensors are further apart, so both tips activate only a single pressure sensor. A message from this sensor is sent to your brain, and you only feel one tip on your skin.

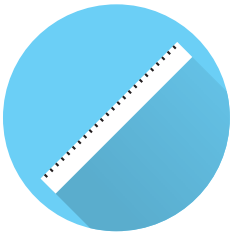
Equipment



Paperclip



Pen and paper



Ruler

Friend

What to do:

1. Straighten the paper clip and then bend into a "U" shape—ensure tips are level and 1cm apart

2. Get your friend to close their eyes

3. Touch both ends of the paper clip (at the same time) on the back of the person's hand and ask if they felt one or two pressure points? If they only felt one pressure point, widen the tips of the paper clip and try again

4. Note the distance, between the ends of the paper clip, where the person goes from feeling one pressure point to feeling two pressure points

5. Repeat this test on the palm, fingertips, forearm, upper arm, shoulder, back, neck, cheek, forehead, nose, legs, tips of toes, soles and upper part of your feet.

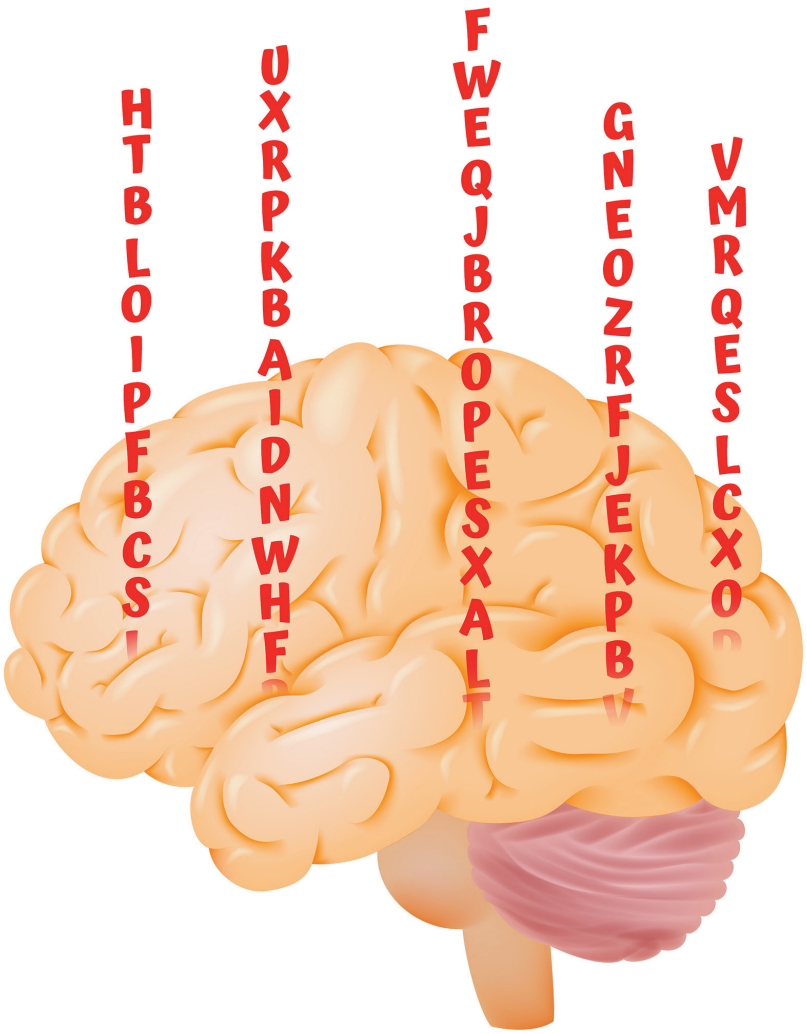
6. Which part of your body can two points be detected with the smallest tip separation? This is the most sensitive part of your body.

Typical values for different body parts

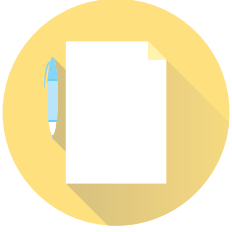
Fingers: 2–3mm	Nose: 7mm	Forehead: 35mm	Shoulder: 41mm
Upper lip: 4–5mm	Palm: 10mm	Forearm: 35mm	Thigh: 42mm
Cheek: 6mm	Foot: 20mm	Upper arm 39mm	Calf: 45mm

Short-term memory

How much can you remember?
Test your memory by doing the "letter-span" experiment.



Equipment



Pen and paper

Some friends

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What to do:

1. Ask two or more of your friends to form a group.

2. Privately, one of you writes down a series of letters beginning with as few as two, making sure they don't spell out a word (eg HT).

3. The same person then continues to write letter-strings, one letter longer at a time (eg a five-letter string such as GTJIK and a 10-letter string such as TBLOIPFBCS).

4. After these letter strings are prepared, the other people in the group listen to each letter string being read out one at a time and after 5 seconds try and write down the letters in the correct order from memory. (Tip: start with the easy two-letter string and progress to the longer ones).

5. See what number letter string you get to before you can't remember any more!

Most people remember perfectly up to about seven or eight letters and then errors start to creep in. Very few people can remember the 10-letter span correctly. The capacity of short-term memory has been described as "the magical number seven plus or minus two".

Neuroscience crossword

Across

6. an extension of the neuron, sends information (4)
7. part of the brain important for balance and posture (10)
8. an extension of the neuron, receives information (8)
9. cells that support neurons (4)
11. connection between two nerve cells (7)
12. connects the two hemispheres of the brain, corpus _____ (8)
13. part of the brain required for new memories, and shaped like a seahorse (11)
15. part of the hippocampus that produces neural stem cells, dentate _____ (5)
18. bumps located on the surface of the cerebrum, separated by sulci (4)
19. part of hippocampus that produces neural stem cells, _____ gyrus (7)
20. part of the brain that relays sensory and motor signals to the cortex (8)
21. group of brain structures deep in the brain associated with voluntary movements, basal _____ (7)
22. connects the brain to the spinal cord (9)
23. connects the two hemispheres of the brain, _____ callosum (6)

Down

1. hollow space within the brain filled with cerebrospinal fluid (9)
2. grooves located on the surface of the cerebrum that separate the gyri (5)
3. largest and most developed part of the brain in mammals (8)
4. a nerve cell (6)
5. almond-shaped part of the brain involved with emotions (8)
10. brain structure that controls the internal environment via the pituitary gland (12)
12. outermost layer of the cerebrum (6)
14. gland at the base of the brain that secretes hormones (9)
16. fatty sheath that sometimes surrounds the axon (6)
17. group of brain structures deep in the brain associated with voluntary movements, _____ ganglia (5)

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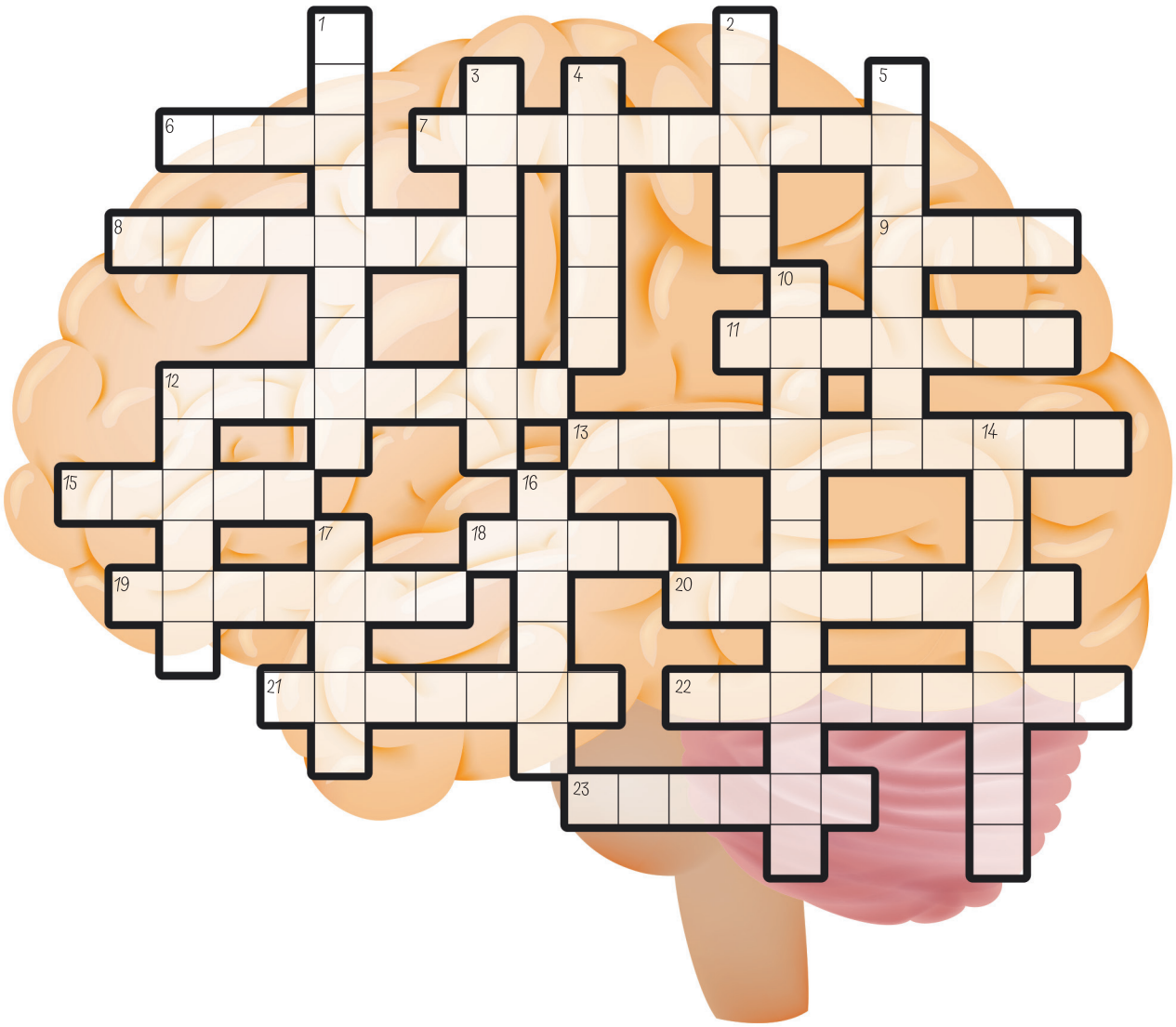

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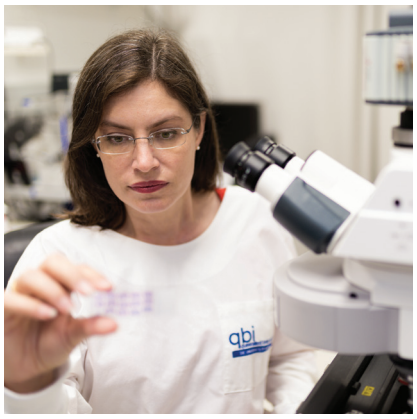

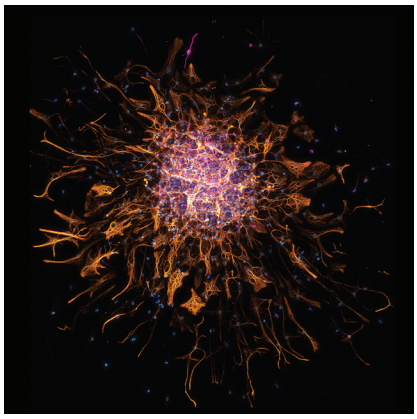



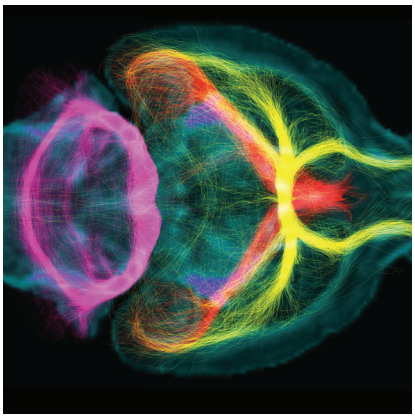


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Help us find cures for dementia, stroke, anxiety and depression, concussion, motor neurone disease and more.

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