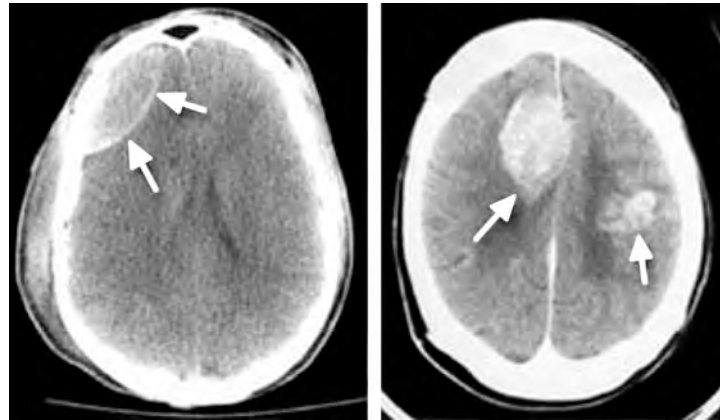


- 1 Computed tomography (CT) and functional magnetic resonance imaging (fMRI) are used to investigate brain structure and function. The CT scans below show two different human brains with abnormal areas. These areas are indicated by arrows.



Magnification $\times 0.2$

- (a) Describe how these images could help a doctor to determine appropriate treatment of the abnormalities.

(2)

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- (b) Explain why the abnormalities in these two brains could cause different symptoms.

(2)

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(c) Describe how fMRI is used to investigate brain function.

(2)

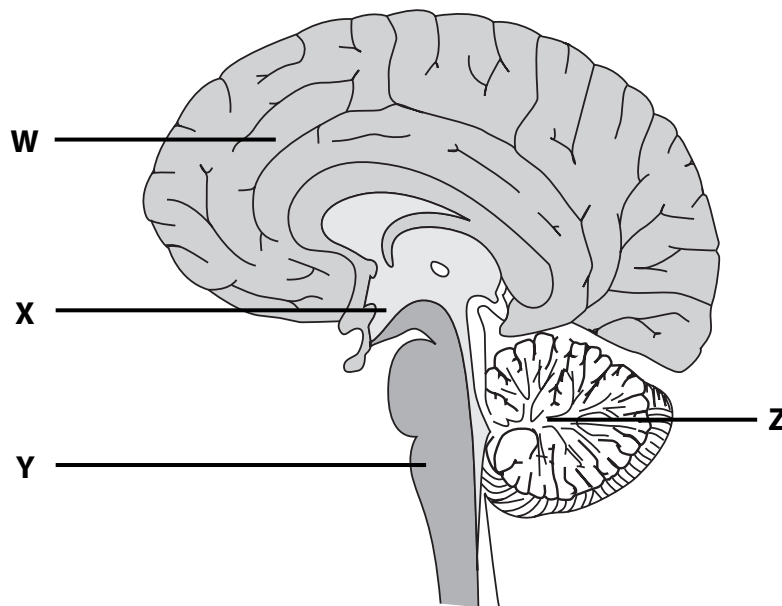
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(d) The diagram below shows a section through the human brain.

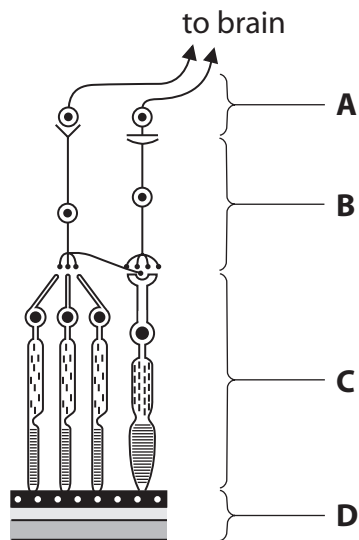


For each of the activities below, indicate the region of the brain **W**, **X**, **Y** or **Z** which will be most involved. Put a cross ☒ in the box corresponding to the correct letter.

(4)

Activity	Region of brain			
	W	X	Y	Z
Regulating core temperature	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Climbing stairs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Regulating carbon dioxide in the blood	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Choosing a gift	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

2 The diagram below shows the position of some of the cells in the retina of the eye.



(a) Place a cross in the box next to the correct letter to complete each of the following statements.

(i) Rod cells are found in the layer labelled

(1)

A **B**

(ii) The neurones of the optic nerve begin in the layer labelled

(1)

A **B**

(iii) In this diagram of the retina, the light would pass through from

(1)

- A** bottom to top
- B** left to right
- C** right to left
- D** top to bottom

- (b) The macula is the central part of the retina in the eye.
Macular degeneration is a common cause of blindness.

Recent research has shown that macular degeneration in adult mice can be successfully treated. This involves injecting embryonic stem cell-derived photoreceptors into their retinas.

- (i) Suggest why this sort of treatment might not restore vision in people with macular problems who have been blind from an early age.

(3)

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- (ii) Suggest why this type of treatment for blindness in humans could be regarded as controversial.

(2)

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- (c) A group of scientists proposed to investigate a treatment for people who have been blind from an early age.

This investigation involves kittens having their eyes kept shut immediately after birth. After 12 weeks, their eyes will be opened and stem cells injected into the cerebral hemispheres of their brains.

These kittens will then be raised for two years in a constant environment and the development of their retinas will be compared with a control group.

- (i) Suggest why the stem cells will be injected into the cerebral hemispheres.

(2)

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- (ii) Suggest why the environment should be kept constant in this investigation.

(2)

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(Total for Question 2 = 12 marks)