AQA GCSE Biology | 8461

SPECIFICATION POINT 4.5.2.2

The brain (biology only)

Past-paper questions

Tier	**Foundation**
Question groups	**22**
Available paper years	**2007–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

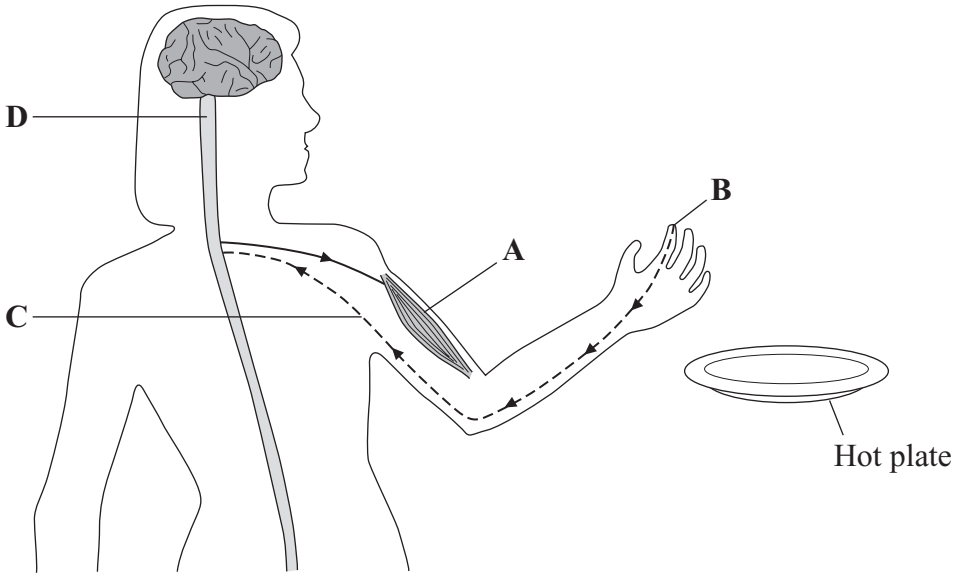
4.5.2.2 The brain (biology only)

Question 01

January 2007 | BLY1F | Original Q3 | Legacy

3 A girl picks up a hot plate. A reflex action causes her to drop it.

The diagram shows some of the structures involved in this reflex action.



Use words from the box to name the structures labelled **A**, **B**, **C** and **D**.

brain	**gland**	**muscle**	**neurone**	**receptor**	**spinal cord**

A .....

B .....

C .....

D .....

(4 marks)

4

4.5.2.2 The brain (biology only)

Question 02

4 (a) Use words from the box to complete the sentences about curing disease.

antibiotics	**antibodies**	**antitoxins**	**painkillers**	**statins**

The substances made by white blood cells to kill pathogens are called ..... .

The substances made by white blood cells to counteract poisons produced by pathogens are called ..... .

Medicines which kill bacteria are called ..... .

(3 marks)

(b) The MMR vaccine protects people against three diseases.

Write down the names of **two** of these diseases.

1 .....

2 .....

(2 marks)

(c) All vaccinations involve some risk.

The table shows the risk of developing harmful effects:

- from the disease if a child is **not** given the MMR vaccine;
- if a child **is** given the MMR vaccine.

Harmful effect	Risk of getting the harmful effect from the disease (if not vaccinated)	Risk of getting the harmful effect from MMR vaccine
Convulsions	1 in 200	1 in 1000
Meningitis	1 in 3000	Less than 1 in 1 000 000
Brain damage	1 in 8000	0

4.5.2.2 The brain (biology only)

Question 02 · continued

BLANK

A mother is considering if she should have her child vaccinated with the MMR vaccine.

Use information from the table to persuade the mother that she should have her child vaccinated.

.....

.....

.....

.....

(2 marks)

(d) The vaccine used to protect us from the Hepatitis B virus is produced by genetic engineering.

Yeast cells are used to produce the vaccine.

Use words from the box to complete the sentence.

chromosomes	**drugs**	**enzymes**	**genes**	**hormones**

To produce the vaccine ..... are used to cut out .....

from the Hepatitis B virus which are then inserted into the yeast cells.

(2 marks)

9

4.5.2.2 The brain (biology only)

Question 03

January 2008 | BLY3F | Original Q6 | Legacy

6 (a) (i) Urine is made in the kidneys and stored for a few hours before being released from the body.

In which organ of the body is urine stored? Draw a circle around **one** answer.

bladder **large intestine** **liver**

(1 mark)

(ii) Which **two** of the following substances are **not** found in the urine of a healthy person?

Tick (✓) **two** boxes.

glucose ☐

mineral ions ☐

protein ☐

urea ☐

(2 marks)

(b) A person with kidney disease may be treated by dialysis or by having a kidney transplant.

Read the information about dialysis and kidney transplants.

- A person needs 3 dialysis sessions a week, each lasting about 8 hours.
- Intake of protein and salt in the food is kept low between dialysis sessions.
- For each patient, dialysis costs £30 000 per year.
- The use of a general anaesthetic can sometimes cause brain damage.
- Drugs to suppress the immune system are given after a kidney transplant.
- A transplant costs £20 000 in the first year plus £6500 in each of the following years for drugs.

BLANK

Use this information to answer the questions.

(i) Give **two** advantages of treatment by having a kidney transplant rather than treatment by dialysis.

1 .....

.....

2 .....

.....

(2 marks)

(ii) Give **one** disadvantage of treatment by having a kidney transplant.

.....

.....

(1 mark)

(c) The table shows the amounts of some substances in the blood of one patient before dialysis and after dialysis.

Substance	Concentration in blood plasma in grams per dm^3	
	Before dialysis	After dialysis
Sodium ions	2.88	3.00
Potassium ions	0.22	0.14
Urea	4.50	0.30

During dialysis, substances are removed from the blood.

(i) Which substance in the table decreased in concentration the most during dialysis?

.....

(1 mark)

(ii) By how much did the concentration of this substance decrease?

..... grams per dm^3

(1 mark)

8

4.5.2.2 The brain (biology only)

Question 04

June 2008 | BLY1AP | Original Q3 | Legacy

QUESTION THREE

This question is about chemicals which may be taken into the body.

Match substances, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A alcohol

B cannabis

C carbon monoxide

D nicotine

1	may damage the liver and the brain
2	may cause reduced oxygen supply to the fetus
3	may lead to mental illness
4	an addictive chemical in cigarette smoke

4.5.2.2 The brain (biology only)

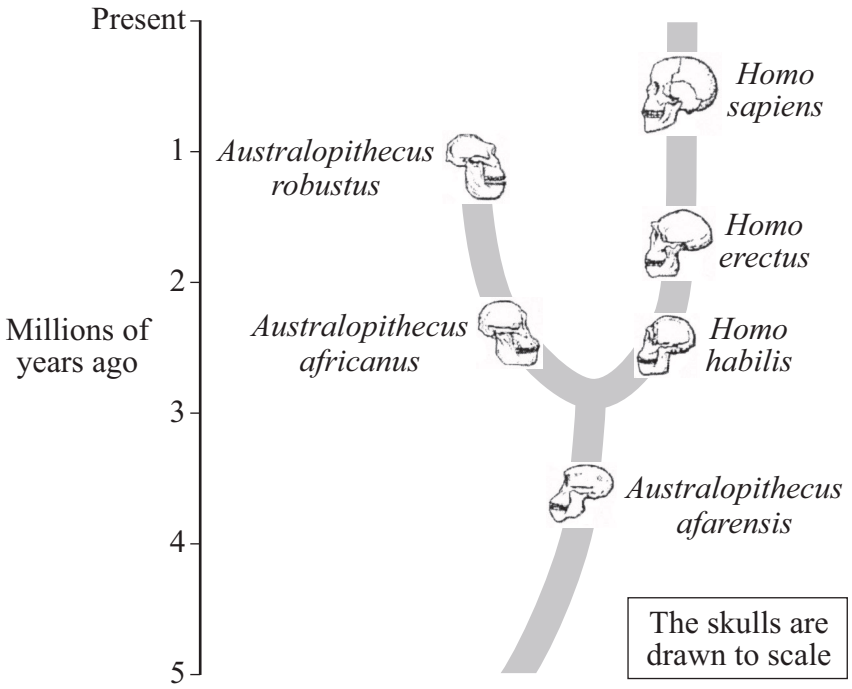
Question 05

June 2008 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

The diagram shows a possible evolutionary tree for humans (*Homo sapiens*).

All the organisms except *Homo sapiens* are extinct.



Match names, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A *Homo sapiens*

B *Australopithecus robustus*

C *Australopithecus afarensis*

D *Homo habilis*

1	the first organism to evolve
2	the direct ancestor of modern humans that evolved $2\frac{1}{2}$ million years ago
3	the organism with the largest brain
4	the organism that became extinct most recently

4.5.2.2 The brain (biology only)

Question 06

June 2008 | BLY1F | Original Q1 | Legacy

1 The drawing shows a group of people in a café.



1 (a) Use words from the box to answer the questions.

brain	**eye**	**nose**	**skin**	**tongue**

Which organ contains receptors that allow a person to:

1 (a) (i) read the newspaper .....

(1 mark)

1 (a) (ii) smell the coffee .....

(1 mark)

1 (a) (iii) feel how hot the cup is .....

(1 mark)

1 (a) (iv) taste the coffee? .....

(1 mark)

4.5.2.2 The brain (biology only)

Question 06 · continued

for mark

1 (b) Smoking is banned in the café.

Name **one** disease that is caused by smoking tobacco.

.....

(1 mark)

1 (c) A cigarette manufacturer increased the amount of nicotine in cigarettes by 11% between 1997 and 2006. The manufacturer did not tell the public about this change.

1 (c) (i) Suggest **one** reason why the manufacturer increased the amount of nicotine in the cigarettes.

.....

.....

(1 mark)

1 (c) (ii) Suggest **one** reason why the manufacturer did not tell the public about the change.

.....

.....

(1 mark)

7

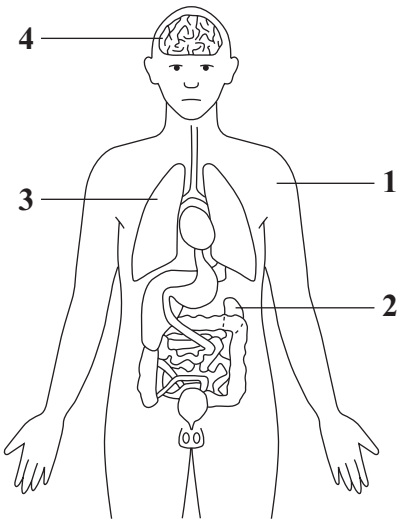
4.5.2.2 The brain (biology only)

Question 07

March 2009 | BLY1AP | Original Q1 | Legacy

QUESTION ONE

The diagram shows some of the organs which help to keep conditions inside the human body constant.



Match statements, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram.

A the skin, which produces sweat

B a lung, which breathes out carbon dioxide

C the brain, which coordinates the other organs

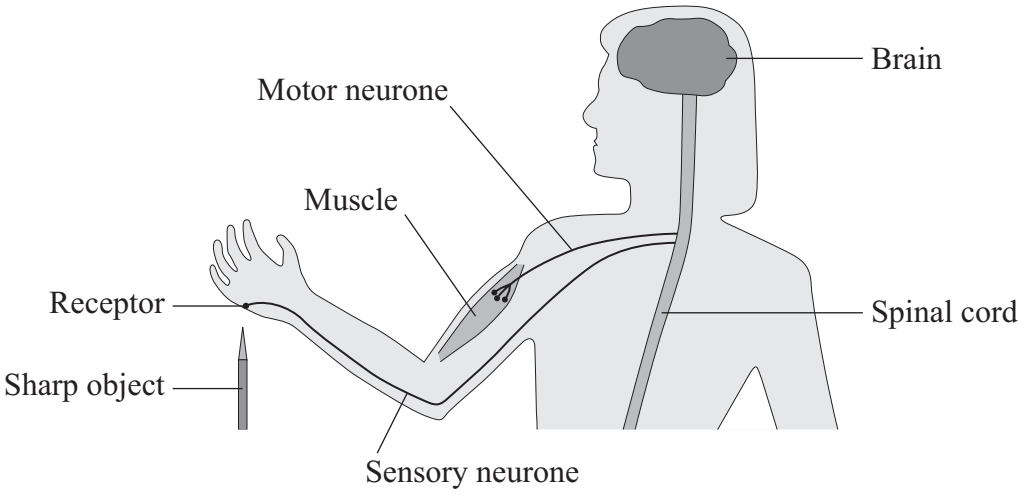
D the kidney, which produces urine

4.5.2.2 The brain (biology only)

Question 08

June 2009 | BLY1F | Original Q3 | Legacy

3 A student accidentally touches a sharp object.
Her hand is immediately pulled away from the object.
The diagram shows the structures involved in this response.



3 (a) Use the correct word or phrase **from the diagram** to complete each sentence.

3 (a) (i) The stimulus is detected by the .....

(1 mark)

3 (a) (ii) Impulses travel to the central nervous system along a

cell called a .....

(1 mark)

3 (a) (iii) Impulses travel from the central nervous system to the effector

along a cell called a .....

(1 mark)

3 (a) (iv) The hand is pulled away from the sharp object by the

.....

(1 mark)

4.5.2.2 The brain (biology only)

Question 08 · continued

for mark

3 (b) Where in the body are there cells sensitive to:

3 (b) (i) light .....

(1 mark)

3 (b) (ii) sound .....

(1 mark)

3 (b) (iii) changes in position?.....

(1 mark)

7

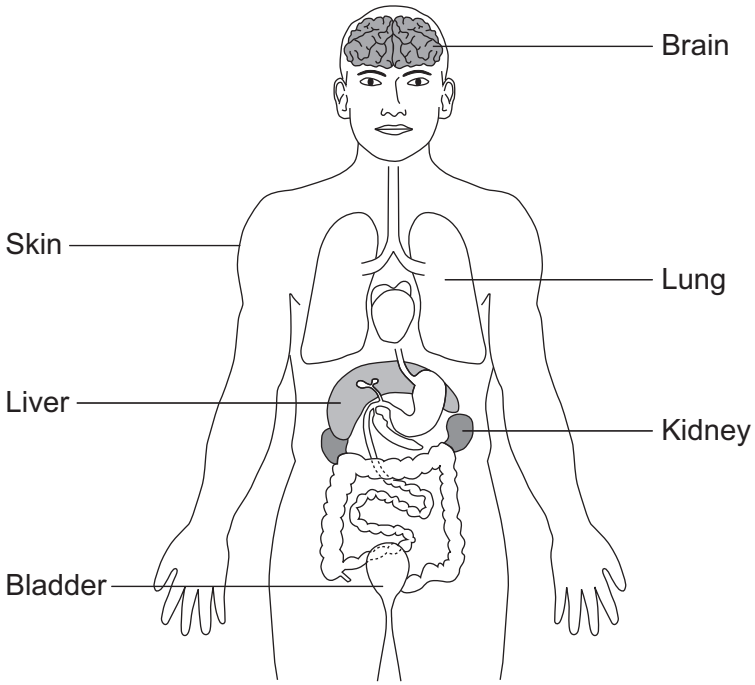
Turn over for the next question

4.5.2.2 The brain (biology only)

Question 09

January 2011 | BLY2F | Original Q2 | Legacy

2 (a) The diagram shows organs which help to control conditions inside the body.



Draw a ring around the correct answer to complete each sentence.

2 (a) (i) Carbon dioxide is removed from the body by the

kidney.
lung.
skin.

(1 mark)

2 (a) (ii) Urine is made in the

kidney.
lung.
skin.

(1 mark)

2 (a) (iii) Urine is stored in the

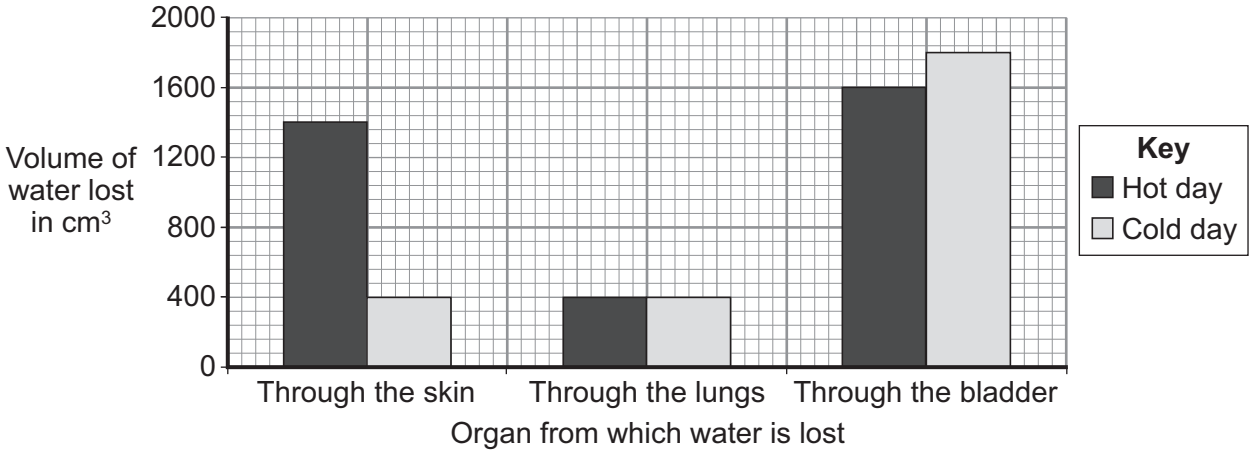
bladder.
liver.
skin.

(1 mark)

4.5.2.2 The brain (biology only)

Question 09 · continued

2 (b) The bar chart shows the volume of water lost from different organs of the body. The information is shown for a hot day and for a cold day.



2 (b) (i) Look at the bar chart.

How does the volume of water lost on the hot day compare with the volume of water lost on the cold day for each organ?

Complete the table using words from the box.

the same	**less**	**more**

Organ	Volume of water lost on a hot day compared with volume of water lost on a cold day
Skin	
Lungs	
Bladder	

(3 marks)

2 (b) (ii) In total, more water is lost on the hot day than on the cold day.

How does the increase in the volume of water lost on the hot day help to control the body temperature?

.....

.....

(1 mark)

7

4.5.2.2 The brain (biology only)

Question 10

7 The table shows the volume of blood flowing through different organs at three levels of exercise.

Organ(s)	Volume of blood flowing through organ(s) in cm^3 per minute		
	Light exercise	**Moderate exercise**	**Heavy exercise**
Gut	1 100	600	300
Kidneys	900	600	250
Brain	750	750	750
Heart muscles	350	750	1 000
Skeletal muscles	4 500	12 500	22 000
Skin	1 500	1 900	600
Other	400	500	100
Total	**9 500**	**17 600**	**25 000**

7 (a) (i) Which organ has a constant flow of blood through it?

.....

(1 mark)

7 (a) (ii) Which organ has the greatest reduction in the volume of blood supplied during heavy exercise compared with light exercise?

.....

(1 mark)

7 (a) (iii) What proportion of the blood flows through the heart muscle during heavy exercise?

.....

(1 mark)

4.5.2.2 The brain (biology only)

Question 10 · continued January 2011 | BLY3F | Original Q7 | Legacy

7 (b) The volume of blood flowing through the skeletal muscles increases greatly during exercise.

Give **two** ways in which the body brings about this increase.

1 .....

.....

2 .....

.....

(2 marks)

7 (c) During exercise, the concentration of carbon dioxide in the blood increases.

Explain what causes this increase.

.....

.....

.....

.....

.....

.....

(3 marks)

8

4.5.2.2 The brain (biology only)

Question 11

June 2011 | BLY1F | Original Q5 | Legacy

5 Caffeine is a *recreational* drug found in drinks such as coffee and cola.

5 (a) What is meant by a *recreational drug*?

.....

.....

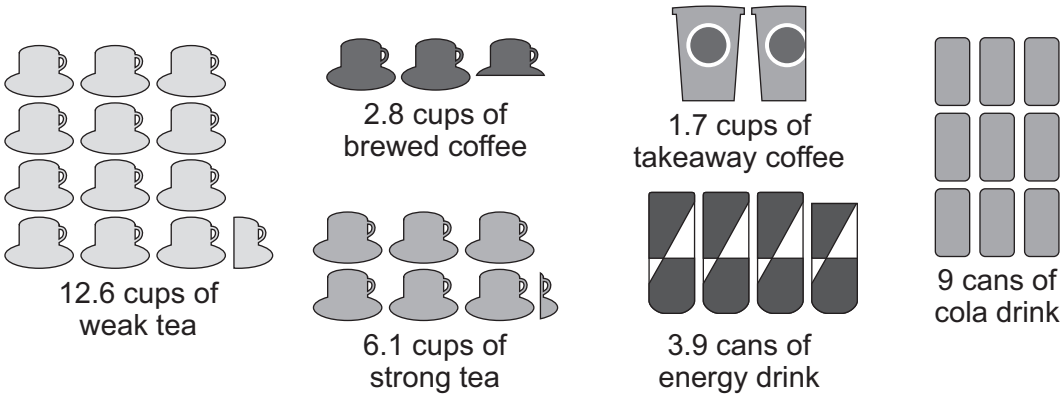
(1 mark)

5 (b) Scientists investigated the effect on the brain of drinking large amounts of caffeine.

They chose students whose drinks contained caffeine equal to at least seven cups of instant coffee each day.

The diagram compares the amount of caffeine in different drinks.

Seven cups of instant coffee a day equals:



5 (b) (i) Seven cups of instant coffee contain 315 mg of caffeine.

How much caffeine is there in **one** cup of instant coffee?

.....

Amount of caffeine ..... mg

(1 mark)

4.5.2.2 The brain (biology only)

Question 11 · continued

5 (b) (ii) Which drink in the diagram contains the highest amount of caffeine?

Tick (✓) **one** box.

A cup of weak tea ☐

A cup of takeaway coffee ☐

A can of cola ☐

(1 mark)

5 (c) Caffeine may cause hallucinations.

One example of a hallucination is hearing voices that are not there.

The scientists found that students who drank more than seven cups of instant coffee per day were three times more likely to have hallucinations than students who drank one cup or less.

Which is the best conclusion?

Tick (✓) **one** box.

Drinking caffeine causes hallucinations. ☐

It is dangerous to drink caffeine. ☐

There is a link between drinking caffeine and hallucinations. ☐

(1 mark)

4

4.5.2.2 The brain (biology only)

Question 12

January 2012 | BL1FP | Original Q6 | Legacy

6 Nicotine is a drug in tobacco smoke. Smoking tobacco is harmful.

6 (a) (i) Many smokers find it difficult to stop smoking.

Complete the sentence.

It is difficult to stop smoking because nicotine is very ..... .

(1 mark)

6 (a) (ii) Nicotine affects synapses in the brain.

What is a synapse?

.....

.....

(1 mark)

6 (b) A drug company has developed a new drug, Drug **A**, to help people stop smoking.

Doctors tested the drug in a double-blind trial with over 2000 volunteers who were smokers.

The volunteers wanted to stop smoking.

The volunteers were divided into three groups. Each volunteer took a tablet once a day for 12 weeks:

- group 1 took Drug **A**
- group 2 took Drug **B** (a drug already in use to stop people smoking)
- group 3 took a placebo.

The smoking habits of each group were recorded for a year.

6 (b) (i) What is a placebo?

.....

(1 mark)

6 (b) (ii) Why is a placebo group used in drug trials?

.....

.....

(1 mark)

4.5.2.2 The brain (biology only)

Question 12 · continued

6 (b) (iii) Which people knew what was in each tablet, in this trial?

Tick (✓) **one** box.

Both doctors and volunteers ☐

Doctors but not volunteers ☐

Neither doctors nor volunteers ☐

(1 mark)

6 (b) (iv) It is important that the three groups of volunteers should be similar.

Give **two** factors that should be similar in the groups of volunteers.

1 .....

2 .....

(2 marks)

6 (c) The table shows the results of the trials.

Tablet	Percentage of volunteers who had stopped smoking	
	After 12 weeks	After 1 year
Drug **A**	44	23
Drug **B**	30	15
Placebo	18	10

A doctor looked at the results of the tests.

The doctor suggested that a smoker who wanted to give up smoking should use Drug **A**.

Why?

.....

.....

(1 mark)

8

4.5.2.2 The brain (biology only)

Question 13

6 Scientists investigated how exercise affects blood flow to different organs in the body.

The scientists made measurements of blood flow to different organs of:

- a person resting in a room at 20 °C
- the same person, in the same room, doing vigorous exercise at constant speed on an exercise cycle.

The table shows the scientists' results.

Organ	Blood flow in cm^3 per minute whilst …	
	resting	doing vigorous exercise
Brain	750	750
Heart	250	1000
Muscles	1200	22 000
Skin	500	600
Other	3100	650

6 (a) In this investigation, it was better to do the exercise indoors on an exercise cycle than to go cycling outdoors on the road.

Suggest **two** reasons why.

Do **not** include safety reasons.

1 .....

.....

.....

2 .....

.....

.....

(2 marks)

6 (b) Blood flow to **one** organ did **not** change between resting and vigorous exercise.

Which organ? .....

(1 mark)

4.5.2.2 The brain (biology only)

Question 13 · continued

6 (c) (i) How much more blood flowed to the muscles during vigorous exercise than when resting?

.....

.....

Answer = ... cm^3 per minute

(2 marks)

6 (c) (ii) Name **two** substances needed in larger amounts by the muscles during vigorous exercise than when resting.

1 .....

2 .....

(2 marks)

6 (c) (iii) Tick (✓) **one** box to complete the sentence.

The substances you named in part **(c)(ii)** helped the muscles to

make more lactic acid. ☐

respire aerobically. ☐

make more glycogen. ☐

(1 mark)

Question 6 continues on the next page

4.5.2.2 The brain (biology only)

Question 13 · continued

6 (c) (iv) The higher rate of blood flow to the muscles during exercise removed larger amounts of waste products made by the muscles.

Which **two** substances need to be removed from the muscles in larger amounts during vigorous exercise?

Tick (✓) **two** boxes.

Amino acids ☐

Carbon dioxide ☐

Glycogen ☐

Lactic acid ☐

(2 marks)

6 (d) The total blood flow was much higher during exercise than when resting.

One way to increase the total blood flow is for the heart to pump out a larger volume of blood each beat.

Give **one** other way to increase the blood flow.

.....

.....

(1 mark)

11

4.5.2.2 The brain (biology only)

Question 14

June 2014 | BL1FP | Original Q6 | Legacy

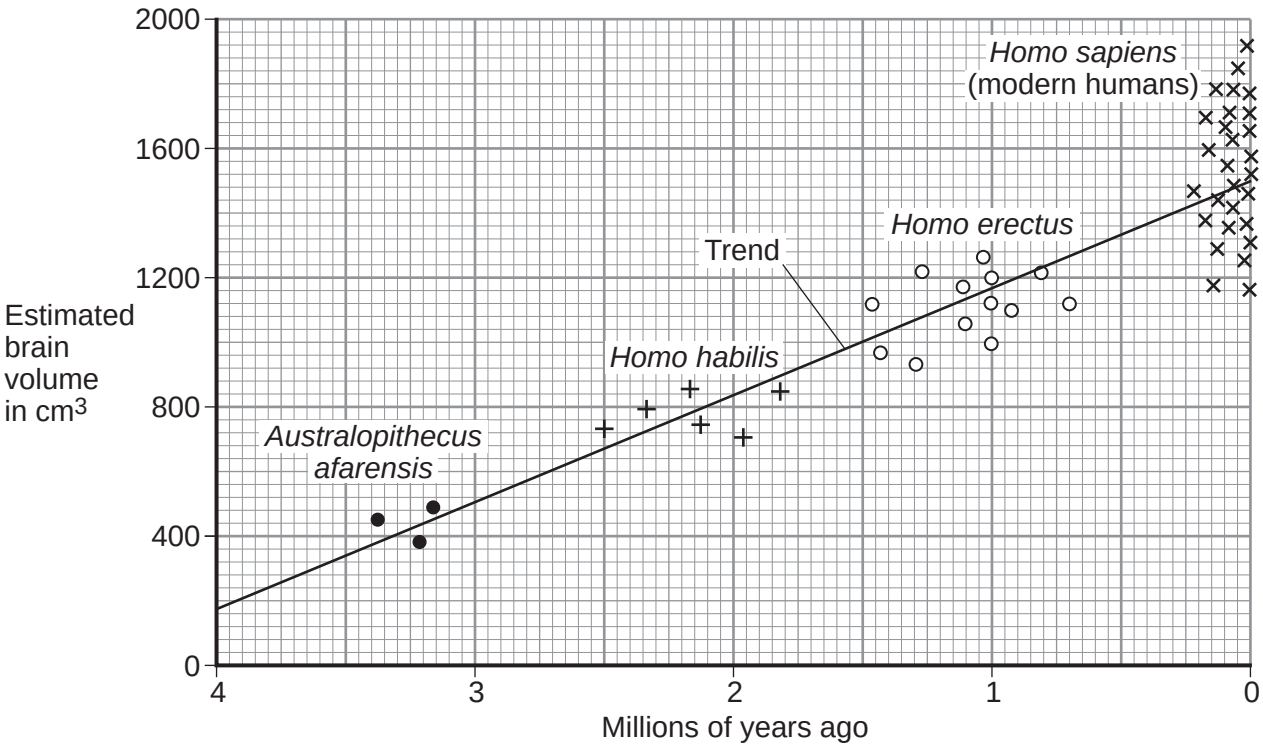
6 This question is about evolution in humans.

Figure 7 shows:

- the estimated brain volume of different species of humans
- the time when the different species existed on Earth.

The data is plotted for modern humans (*Homo sapiens*) and for three types of extinct ancestors of humans.

Figure 7



Key
Each point plotted on the graph shows the estimate for one human.

6 (a) (i) As humans evolved, their brain volume changed.

What has happened to human brain volume over the past 4 million years?

[1 mark]

.....

.....

4.5.2.2 The brain (biology only)

Question 14 · continued

6 (a) (ii) Why is the evidence for estimated brain volume for *Homo sapiens* stronger than the evidence for *Australopithecus afarensis*?

[1 mark]

.....

.....

6 (b) In a book, the brain volume of a different species, *Australopithecus africanus*, is stated to be about 600 cm^3.

Use evidence from **Figure 7** to estimate when *Australopithecus africanus* lived on Earth.

[1 mark]

Estimate = ... million years ago

6 (c) Scientists believe that modern humans evolved by natural selection from *Australopithecus afarensis*.

6 (c) (i) Complete the following sentence.

[1 mark]

In the nineteenth century, the scientist who suggested the theory of evolution by

natural selection was Charles ..... .

6 (c) (ii) In the nineteenth century, many people did **not** accept this scientist's theory.

Give **one** reason why.

[1 mark]

.....

.....

5

4.5.2.2 The brain (biology only)

Question 15

June 2014 | BL3FP | Original Q2 | Legacy

2 Human body temperature must be kept within narrow limits.

Figure 4 shows a cyclist in a race.

Figure 4



2 (a) Use the correct answer from the box to complete each sentence.

[3 marks]

blood	**brain**	**kidney**	**sweat**	**urine**

The cyclist's body temperature is monitored by a centre in the ..... .

This centre is sensitive to the temperature of the cyclist's ..... .

If the cyclist's body temperature increases, his body increases

the production of ..... .

4.5.2.2 The brain (biology only)

Question 15 · continued

2 (b) (i) Cyclists drink sports drinks after a race.

Table 1 shows the ratio of glucose to ions in three sports drinks, **A**, **B** and **C**.

Table 1

	Sports drink		
	A	**B**	**C**
Ratio of glucose (g per dm^3) to ions (mg per dm^3)	15:14	12:1	2:7

The closer this ratio of glucose to ions is to 1:1 in a sports drink, the faster the body replaces water.

Which sports drink, **A**, **B** or **C**, would replace water fastest in an athlete? ☐

[1 mark]

2 (b) (ii) Why should sports drinks contain ions?

[1 mark]

.....

.....

2 (b) (iii) Why should a person with diabetes **not** drink too much sports drink?

[1 mark]

.....

.....

6

4.5.2.2 The brain (biology only)

Question 16

June 2016 | BL1FP | Original Q7 | Legacy

7 Nicotine and alcohol are drugs that affect the brain.

7 (a) (i) What is the correct description of both nicotine and alcohol?

[1 mark]

Tick (✓) **one** box.

- illegal, medical drugs ☐
- illegal, recreational drugs ☐
- legal, medical drugs ☐
- legal, recreational drugs ☐

7 (a) (ii) Why do people find it difficult to stop smoking?

[1 mark]

_____

_____

7 (b) A drug company has developed a new drug which helps people to stop smoking.
The new drug prevents the feeling of pleasure caused by nicotine in the smoke.

The new drug is now being tested on rats which have been given a lot of alcohol to drink.
The company wants to find out if the drug can help people to stop drinking alcohol.

7 (b) (i) It is important that the tests on rats are done by an independent company.

What is meant by an independent company?

[1 mark]

_____

_____

4.5.2.2 The brain (biology only)

Question 16 · continued

7 (b) (ii) Why is it important that the tests are done by an independent company?

[1 mark]

7 (b) (iii) Some scientists believe that the part of the brain sensitive to alcohol is the same as the part of the brain sensitive to nicotine.

Explain why the new drug might be useful for treating people who find it difficult to stop drinking alcohol.

[2 marks]

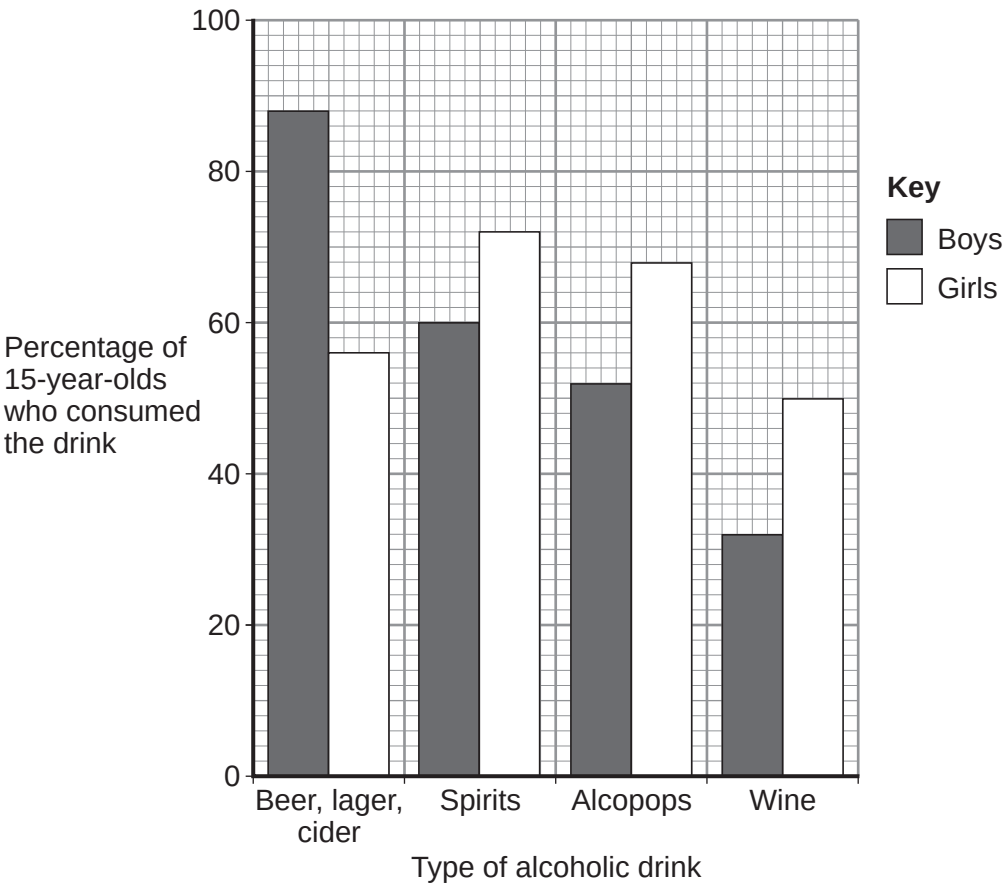
Question 7 continues on the next page

4.5.2.2 The brain (biology only)

Question 16 · continued

7 (c) **Figure 8** shows the results of a survey into the different types of alcoholic drinks consumed by one hundred 15-year-old boys and one hundred 15-year-old girls in the UK.

Figure 8



7 (c) (i) Describe the differences between the **types** of alcoholic drink consumed by boys and by girls.

Use **only** information from **Figure 8**.

[2 marks]

7 (c) (ii) A newspaper headline stated:

"All boys drink alcohol"

Use information from part **(c)** and **Figure 8** to give **one** reason why the newspaper headline may **not** be correct.

[1 mark]

9

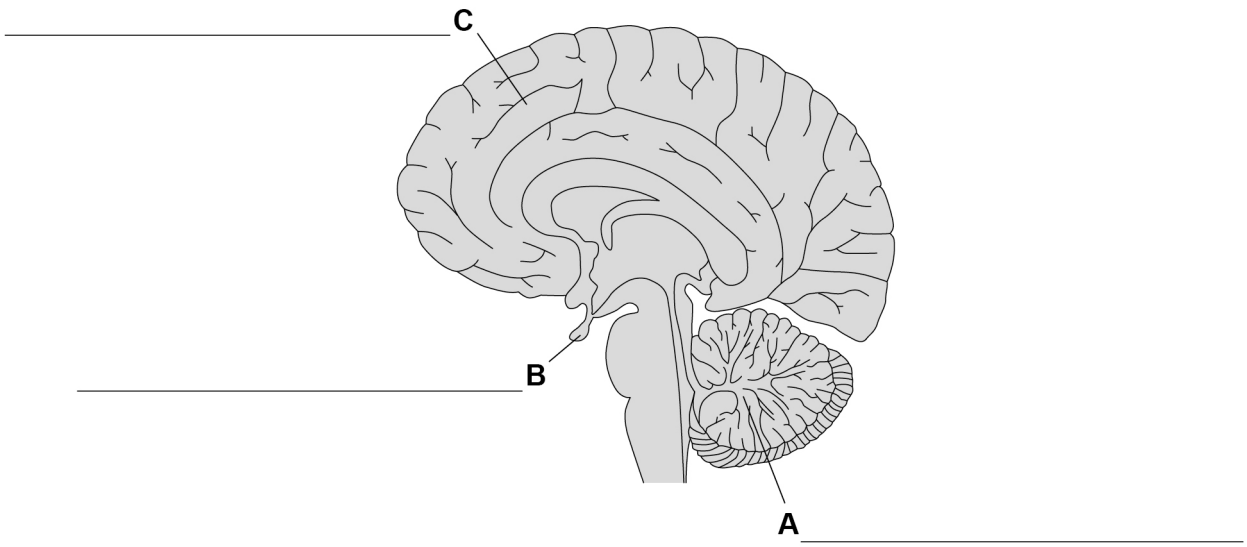
4.5.2.2 The brain (biology only)

Question 17

November 2020 | 8461/2F | Original Q5

0 5 **Figure 6** shows the brain.

Figure 6



0 5 . 1 Label **A**, **B** and **C** on **Figure 6**.

[3 marks]

Choose answers from the box.

cerebellum	**cerebral cortex**	**medulla**	**pituitary gland**

0 5 . 2 Which part of the brain controls balance when riding a bicycle?

[1 mark]

Tick (✓) **one** box.

Cerebellum ☐

Medulla ☐

Pituitary gland ☐

Question 5 continues on the next page

4.5.2.2 The brain (biology only)

Question 17 · continued

November 2020 | 8461/2F | Original Q5

0 5 . 3 The ears send information about sound to the brain.

Which word describes the brain?

[1 mark]

Tick (✓) **one** box.

- Coordinator ☐
- Effector ☐
- Receptor ☐
- Stimulus ☐

0 5 . 4 What type of cell carries impulses from the ears to the brain?

[1 mark]

_____

0 5 . 5 Human eyes detect light.

Which part of the eye has cells that detect light?

[1 mark]

Tick (✓) **one** box.

- Iris ☐
- Lens ☐
- Retina ☐

4.5.2.2 The brain (biology only)

Question 17 · continued

0 5 . 6 The eyes of some birds have specialised cells to detect ultraviolet (UV) light.

Some fruits reflect UV light.

Explain why it is an advantage for birds to be able to detect UV light.

[2 marks]

Question 5 continues on the next page

4.5.2.2 The brain (biology only)

Question 17 · continued

Figure 7 shows a student reading a book.

Figure 7



There are trees on the far side of the field.

The student looks at the trees instead of looking at the book.

0 5 . 7 What process occurs in the eye when the student looks at the trees instead of looking at the book?

[1 mark]

Tick (✓) **one** box.

Accommodation ☐

Magnification ☐

Reflection ☐

4.5.2.2 The brain (biology only)

Question 17 · continued

0 5 . 8 What change happens in the student's eyes when they look up at the trees?

[1 mark]

Tick (✓) **one** box.

Light rays are refracted less ☐

More light is reflected ☐

The optic nerves move ☐

0 5 . 9 The student **cannot** see the trees in focus.

Name the common defect of the eye which causes distant objects to appear out of focus.

[1 mark]

_____

12

4.5.2.2 The brain (biology only)

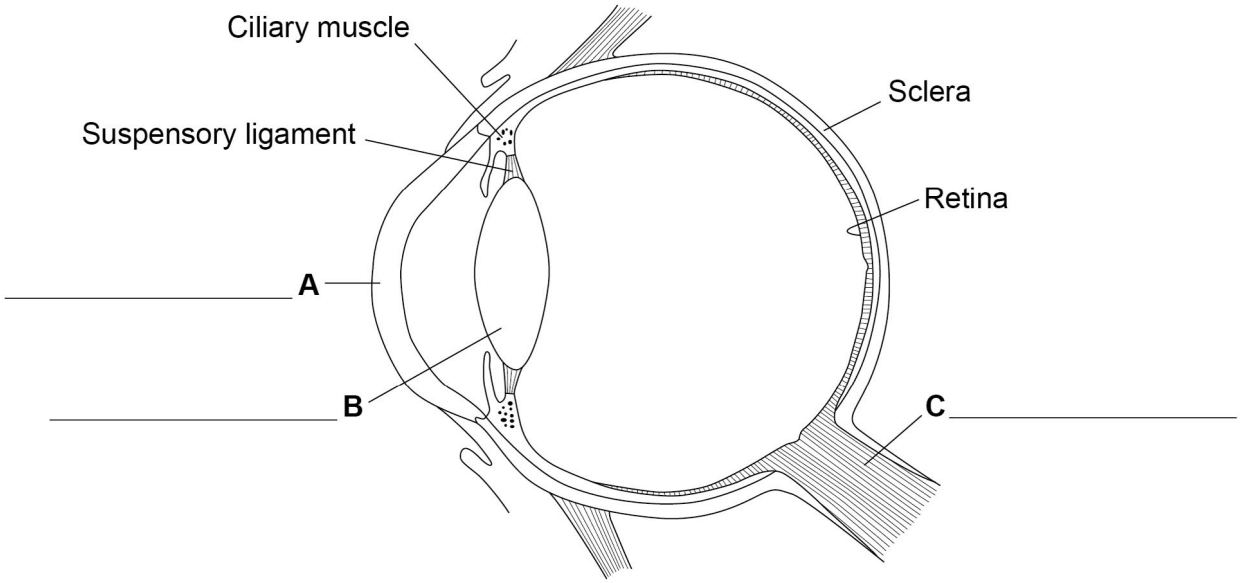
Question 18

November 2021 | 8461/2F | Original Q4

0 4 The human eye can form images of objects that are at different distances away from the eye.

Figure 7 is a diagram of the eye.

Figure 7



0 4 . 1 Label structures **A**, **B** and **C** on **Figure 7**.

[3 marks]

Choose answers from the box.

cornea	**eyelid**	**iris**	**lens**	**optic nerve**

4.5.2.2 The brain (biology only)

Question 18 · continued

The eye in **Figure 7** is focused on a distant object.

If the eye then focuses on the words in a book, changes would occur in the eye.

The light rays would be refracted more by the lens.

0 4 . 2 How does the lens refract the light more?

[1 mark]

Tick (✓) **one** box.

- By becoming longer ☐
- By becoming thicker ☐
- By becoming transparent ☐

0 4 . 3 Which **two** structures control the shape of the lens?

[2 marks]

Tick (✓) **two** boxes.

- Ciliary muscles ☐
- Cornea ☐
- Iris ☐
- Sclera ☐
- Suspensory ligaments ☐

0 4 . 4 To form a clear image, the light rays entering the eye must focus on one structure in the eye.

Name the structure.

[1 mark]

_____

Question 4 continues on the next page

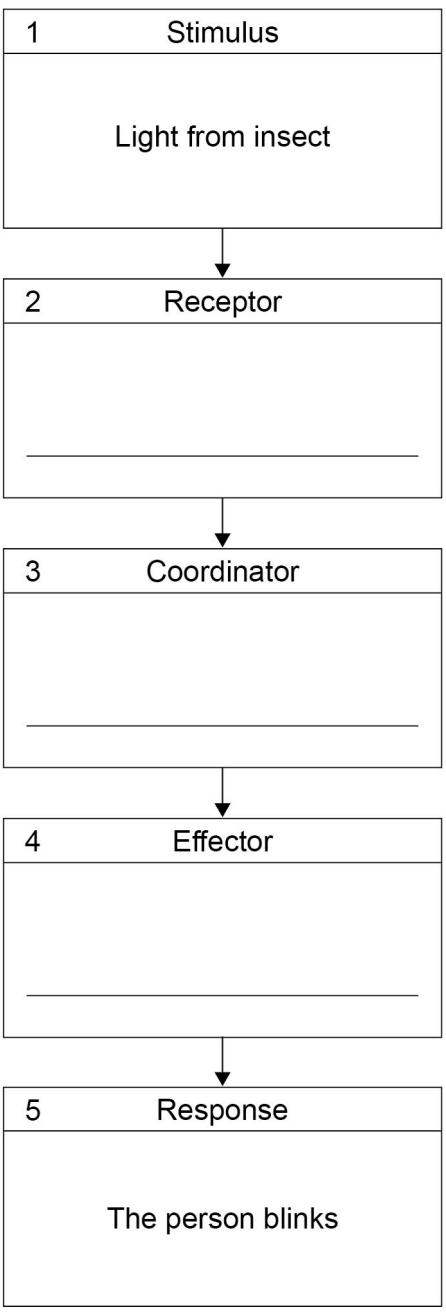
4.5.2.2 The brain (biology only)

Question 18 · continued

0 4 . 5 An insect flies near a person's eye. The person blinks.
This is a reflex action.

Figure 8 shows the coordination system for this reflex action.

Figure 8



Complete **Figure 8**.

[2 marks]

Choose answers from the box below.

Write **one** word in each of boxes **2**, **3** and **4** of **Figure 8**.

brain	**cornea**	**iris**	**muscles**	**retina**

9

4.5.2.2 The brain (biology only)

Question 19

November 2021 | 8461/2F | Original Q10

1 0 Human body temperature is controlled within very narrow limits.

Scientists investigated the effect of drinking ice-cold water on:

- internal body temperature
- the rate of sweating.

This is the method used.

1. Sit a person inside a room kept at a constant temperature of 25 °C.
2. Measure the person's internal body temperature near the brain.
3. Measure the person's rate of sweating.
4. After 20 minutes, give the person 500 cm^3 of ice-cold water to drink.
5. Continue to measure the person's internal body temperature and sweating rate for a further 50 minutes.

1 0 . 1 Give the reason why the person should **not** move during the investigation.

[1 mark]

Question 10 continues on the next page

4.5.2.2 The brain (biology only)

Question 19 · continued

Figure 17 and **Figure 18** show the scientists' results.

Figure 17

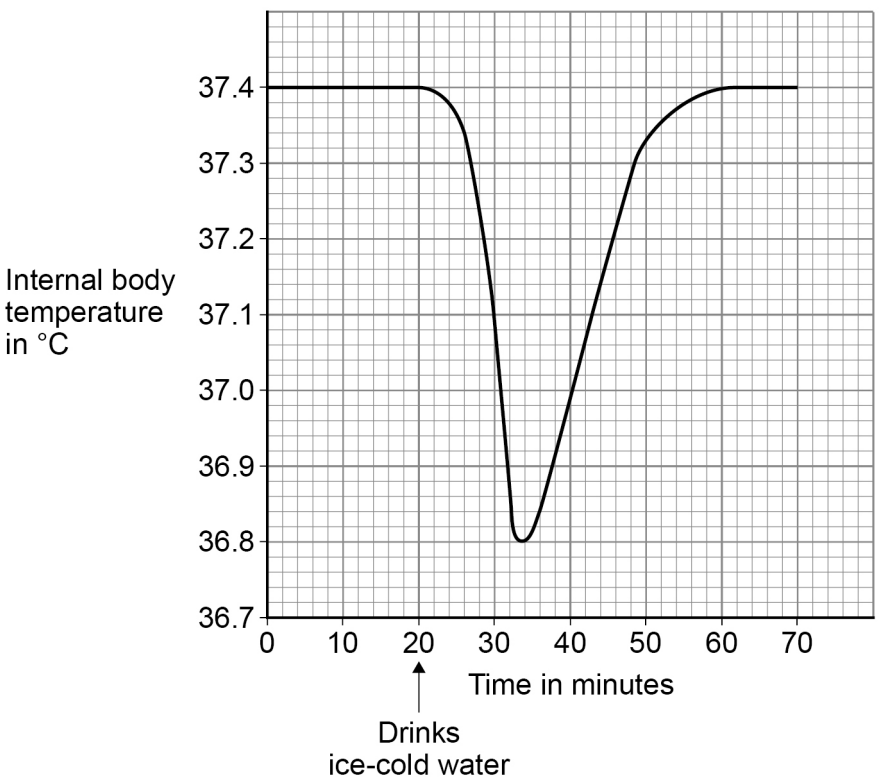
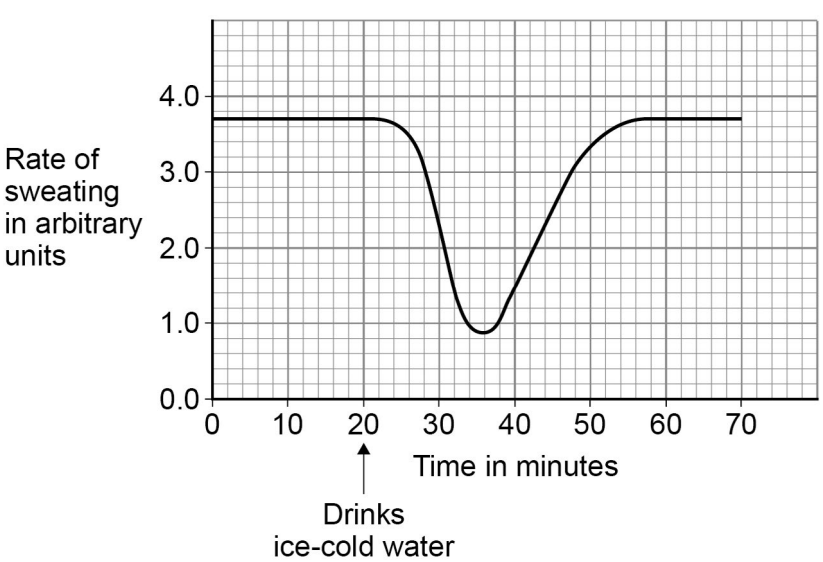


Figure 18



4.5.2.2 The brain (biology only)

Question 19 · continued

10.2 What is this person's normal internal body temperature?

[1 mark]

Tick (✓) **one** box.

36.8 °C ☐ 37.0 °C ☐ 37.4 °C ☐

The results show that when the ice-cold water was drunk, the temperature near the brain decreased.

10.3 Explain why the temperature near the brain decreased.

[2 marks]

10.4 The thermoregulatory centre in the brain responds to the decrease in temperature.

How does the thermoregulatory centre send information to sweat glands in the skin?

[1 mark]

10.5 The rate of sweating changes between 24 minutes and 36 minutes.

Explain how this change helps to maintain the person's normal body temperature.

[2 marks]

Question 10 continues on the next page

4.5.2.2 The brain (biology only)

Question 19 · continued

10.6 During exercise, the skin appears red.

What causes the skin to appear red?

[1 mark]

Tick (✓) **one** box.

- Blood vessels moving closer to the skin surface ☐
- Constriction of blood vessels in the skin ☐
- Decrease in heart rate ☐
- Dilation of blood vessels in the skin ☐

8

Turn over for the next question

4.5.2.2 The brain (biology only)

Question 20

June 2023 | 8461/1F | Original Q2

0 2 Viruses cause disease.

0 2 . 1 What name is given to microorganisms that cause disease?

[1 mark]

Tick (✓) **one** box.

- Pathogens ☐
- Predators ☐
- Producers ☐

0 2 . 2 The body has defences to stop viruses entering.

Draw **one** line from each defence to the part of the body that provides the defence.

[2 marks]

Defence	Part of the body that provides the defence
	Brain
A physical barrier that stops viruses entering	Heart
Mucus that traps viruses	Nose
	Skin

4.5.2.2 The brain (biology only)

Question 20 · continued

Some viruses can cause tumours to develop.

0 2 . 3 Complete the sentence.

Choose the answer from the box.

[1 mark]

digestion	division	metabolism

A tumour can form when changes to cells cause uncontrolled cell _____.

0 2 . 4 Malignant tumours are cancers.

Which **two** sentences describe malignant tumours?

[2 marks]

Tick (✓) **two** boxes.

- Malignant tumours are only found in the reproductive system. ☐
- Malignant tumours contain digestive enzymes. ☐
- Malignant tumours do not change in size. ☐
- Malignant tumours have cells that can spread to other parts of the body. ☐
- Malignant tumours may form secondary tumours. ☐

Question 2 continues on the next page

HPV is a virus that can cause one type of cancer in females.

In the UK since 2008, most 12 to 13-year-old females have been vaccinated against HPV.

Scientists investigated the percentage of 16 to 18-year-old females with HPV.

Table 2 shows the results.

Table 2

Year	Percentage (%) of 16 to 18-year-old females with HPV
2010	8.2
2012	3.2
2014	2.0
2016	1.6

0 2 . 5 What does **Table 2** show about the percentage of females with HPV from 2010 to 2016?

[1 mark]

0 2 . 6 Suggest the reason for the change you described in Question **02.5**.

[1 mark]

4.5.2.2 The brain (biology only)

Question 20 · continued

The HPV vaccine contains an inactive form of the virus.

The inactive form of the virus is injected into the body.

0 2 . 7 Which part of the blood responds to the inactive virus?

[1 mark]

Tick (✓) **one** box.

- Platelets ☐
- Red blood cells ☐
- White blood cells ☐

0 2 . 8 What is produced by the body in response to the inactive virus?

[1 mark]

Tick (✓) **one** box.

- Antibiotics ☐
- Antibodies ☐
- Antiseptics ☐

0 2 . 9 Suggest **one** reason why some **parents** refuse to allow their children to have the HPV vaccine.

Do **not** refer to the pain of the injection in your answer.

[1 mark]

_____

_____

11

4.5.2.2 The brain (biology only)

Question 21

June 2024 | 8461/2F | Original Q1

0 1 The nervous system allows humans to:

- respond to stimuli
- coordinate their behaviour.

0 1 . 1 Complete the order of structures to link a stimulus to a response.

[2 marks]

Choose answers from the box.

coordinator	**effector**	**receptor**

stimulus ⟶ _____ ⟶ _____ ⟶ _____ ⟶ response

0 1 . 2 Some human actions are reflex actions.

What is a reflex action?

[2 marks]

4.5.2.2 The brain (biology only)

Question 21 · continued

0 1 . 3 Which is an example of a reflex action?

[1 mark]

Tick (✓) **one** box.

- Blinking in sudden bright light ☐
- Kicking a ball in a game ☐
- Writing a message to a friend ☐

0 1 . 4 Many reflex actions are movements.

What type of tissue causes movement?

[1 mark]

Tick (✓) **one** box.

- Blood ☐
- Gland ☐
- Muscle ☐

Question 1 continues on the next page

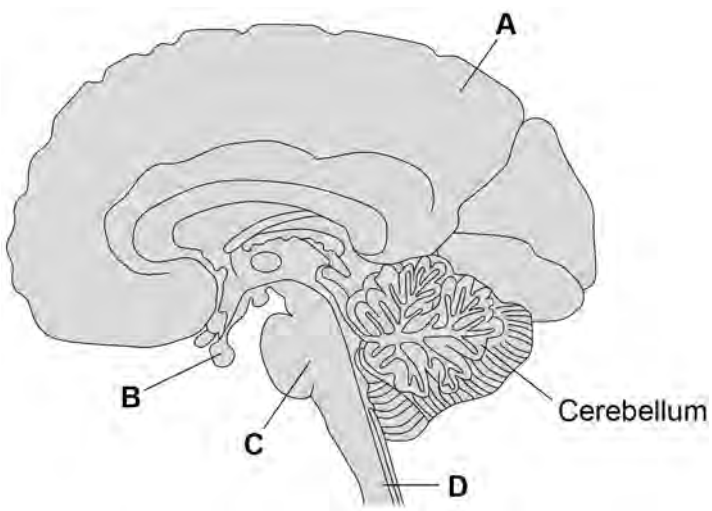
4.5.2.2 The brain (biology only)

Question 21 · continued

Many human activities are coordinated by the brain.

Figure 1 shows the human brain.

Figure 1



0 1 . 5 Which structure in **Figure 1** is the pituitary gland?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 1 . 6 Which structure in **Figure 1** is the cerebral cortex?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.5.2.2 The brain (biology only)

Question 21 · continued

0 1 . 7 What is the function of the cerebellum?

[1 mark]

Tick (✓) **one** box.

Balance ☐

Hearing ☐

Sight ☐

9

Turn over for the next question

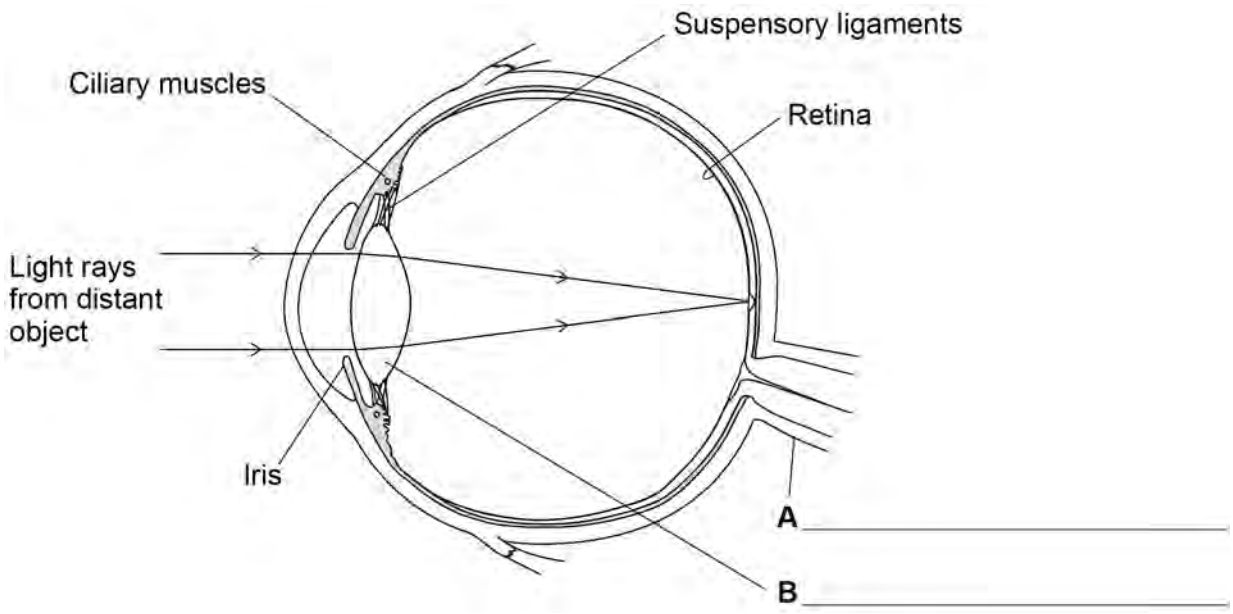
4.5.2.2 The brain (biology only)

Question 22

0 4 The human eye can make clear images of objects.

Figure 4 shows how the human eye focuses light rays from a distant object onto the retina.

Figure 4



0 4 . 1 Label structures **A** and **B** on **Figure 4**.

Choose answers from the box.

[2 marks]

cornea	**lens**	**optic nerve**	**sclera**

The eye in **Figure 4** is focused on a distant object.

0 4 . 2 Complete the sentence.

Choose the answer from the box.

[1 mark]

contract	**expand**	**stretch**

To focus on a **near** object the ciliary muscles _____.

4.5.2.2 The brain (biology only)

Question 22 · continued

0 4 . 3 Complete the sentence.

Choose the answer from the box.

[1 mark]

longer	**thicker**	**thinner**

To focus on a **near** object structure **B** in **Figure 4**

becomes _____.

0 4 . 4 The eye in **Figure 4** is looking at an object in dim light.

Complete the sentence.

Choose the answer from the box.

[1 mark]

iris	**retina**	**suspensory ligaments**

When the eye looks at an object in **bright** light the pupil gets smaller.

The size of the pupil is controlled by the _____.

0 4 . 5 The retina is sensitive to light.

How does information from the retina reach the brain via structure **A** in **Figure 4**?

[1 mark]

_____

_____

Question 4 continues on the next page

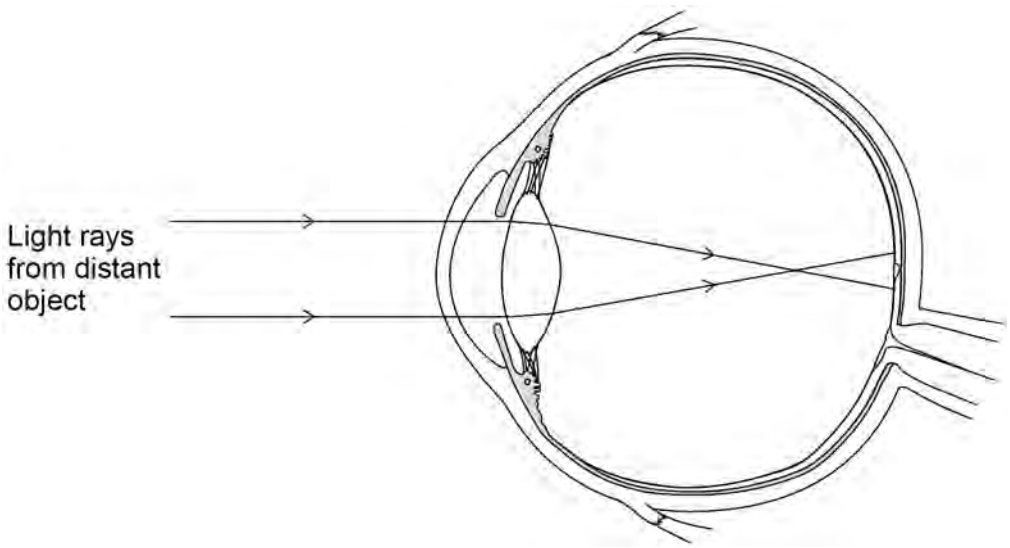
4.5.2.2 The brain (biology only)

Question 22 · continued

Figure 5 shows the eye of a person who is short sighted looking at a distant object.

The person **cannot** see the object clearly.

Figure 5



0 4 . 6 Give the reason why the person **cannot** see the object clearly.

[1 mark]

0 4 . 7 Short sightedness can be corrected using spectacle lenses.

Give **one** other way short sightedness can be corrected.

Do **not** refer to spectacles in your answer.

[1 mark]

8