AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.5.3.6

Feedback systems (HT only)

Past-paper questions

Tier	**Higher**
Question groups	**3**
Available paper years	**2021–2024**

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.

4.5.3.6 Feedback systems (HT only)

Question 01

November 2021 | 8464/B/2H | Original Q5

0 5 Caffeine is a drug that decreases reaction time.

A group of sixteen students investigated the effect of caffeine on reaction time.

The students were all 15-year-old girls.

The group was divided into 8 pairs of students.

This is the method used.

1. Student **A** starts two stopwatches at the same time.
2. Student **A** then gives one of the stopwatches to Student **B**.
3. Student **A** says "stop" at the same time as stopping her stopwatch. Student **B** stops her stopwatch as quickly as possible after Student **A** says "stop".
4. The difference in time shown on the two stopwatches is recorded. This is the reaction time of Student **B**.
5. Student **B** drinks a caffeinated drink.
6. The students wait 15 minutes and then repeat steps 1 to 4.

0 5 . 1 Suggest **one** control variable the students should have used in the investigation.

Do **not** refer to age or sex in your answer.

[1 mark]

4.5.3.6 Feedback systems (HT only)

Question 01 · continued

0 5 . 2 Suggest **two** sources of random error when using this method to measure a person's reaction time.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

Question 5 continues on the next page

4.5.3.6 Feedback systems (HT only)

Question 01 · continued

Table 1 shows the results.

Table 1

Student pair	Decrease in reaction time after drinking the caffeinated drink in seconds
1	0.039
2	0.021
3	0.027
4	0.041
5	0.022
6	0.036
7	0.024
8	0.097

0 5 . 3 Why can a mode **not** be determined for the data in **Table 1**?

[1 mark]

0 5 . 4 The students decided the result from pair **8** was anomalous.

The students calculated that the mean decrease in reaction time was 0.030 seconds.

Describe how the students calculated the mean decrease in reaction time.

[1 mark]

4.5.3.6 Feedback systems (HT only)

Question 01 · continued

0 5 . 5 Caffeine causes the release of adrenaline.

Adrenaline affects heart rate.

Explain how the effect of adrenaline on heart rate might cause reaction time to decrease.

[4 marks]

Question 5 continues on the next page

4.5.3.6 Feedback systems (HT only)

Question 01 · continued

Adenosine is a different chemical made by the body.

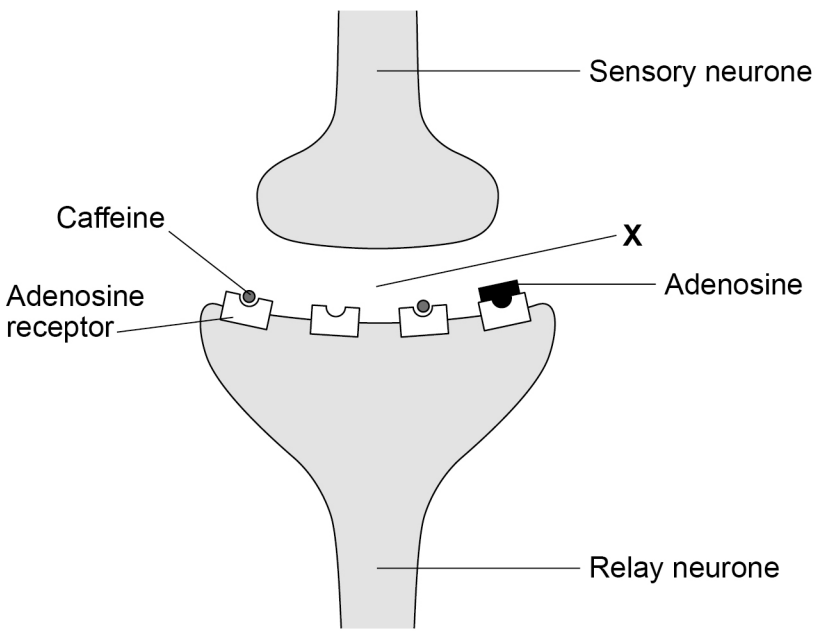
Adenosine binds to receptors on relay neurones.

Adenosine decreases the number of impulses in relay neurones.

Figure 5 shows how caffeine binds to adenosine receptors on a relay neurone.

When caffeine binds to adenosine receptors it blocks the receptor so adenosine cannot bind.

Figure 5



0 5 . 6 Label **X** shows the gap between the sensory neurone and the relay neurone.

What is the name of the gap labelled **X**?

[1 mark]

4.5.3.6 Feedback systems (HT only)

Question 01 · continued

0 5 . 7 Suggest why reaction time decreases when caffeine binds to adenosine receptors.

[2 marks]

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Turn over for the next question

4.5.3.6 Feedback systems (HT only)

Question 02

June 2023 | 8464/B/2H | Original Q6

0 6 The control of body temperature is an example of homeostasis.

0 6 . 1 Give **one** other internal condition controlled by homeostasis.

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

[1 mark]

0 6 . 2 Explain why the control of body temperature is important.

[2 marks]

Question 6 continues on the next page

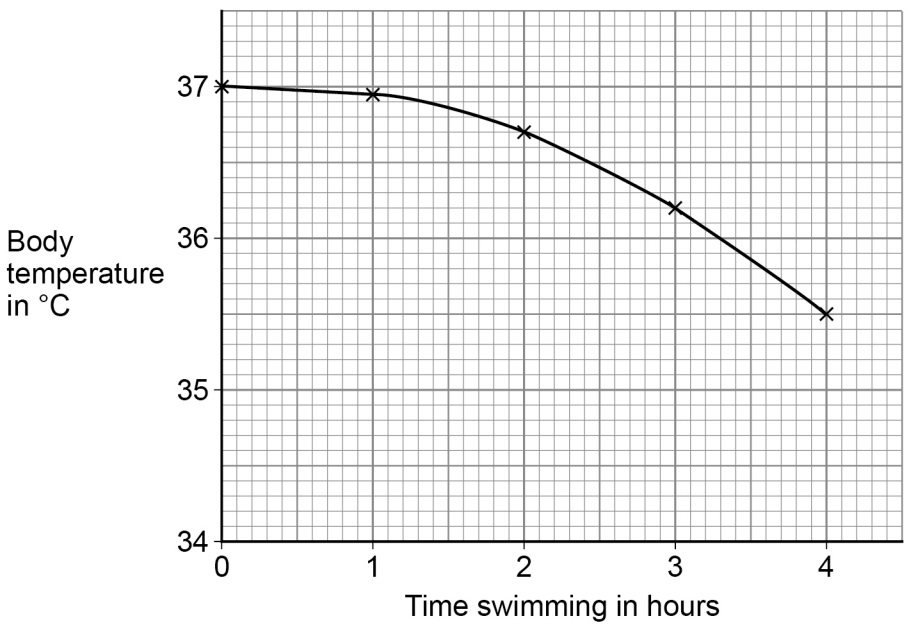
4.5.3.6 Feedback systems (HT only)

Question 02 · continued

The body temperature of long-distance swimmers can change as the length of time swimming in cold water increases.

Figure 4 shows how the body temperature of one swimmer changed in the first 4 hours of a long-distance swim.

Figure 4



0 6 . 3 Calculate the mean rate of body temperature decrease per hour in the first 4 hours of the swim.

[2 marks]

Rate = _____ °C per hour

4.5.3.6 Feedback systems (HT only)

Question 02 · continued

0 6 . 4 Hypothermia is a dangerously low body temperature.

For this swimmer, a 5.5% decrease in body temperature from the start of the swim will cause hypothermia.

Determine the body temperature at which this swimmer will start to have hypothermia.

Give your answer to 2 significant figures.

[4 marks]

Body temperature (2 significant figures) = _____ °C

Question 6 continues on the next page

4.5.3.6 Feedback systems (HT only)

Question 02 · continued

A decrease in body temperature causes the adrenal glands and the thyroid gland to be stimulated.

0 6 . 5 Which gland secretes hormones to stimulate the adrenal glands?

[1 mark]

0 6 . 6 Explain the role of the adrenal glands in responding to a decrease in body temperature.

[5 marks]

4.5.3.6 Feedback systems (HT only)

Question 02 · continued

0 6 . 7 Explain how the thyroid gland controls the response to a decrease in body temperature by negative feedback.

[3 marks]

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4.5.3.6 Feedback systems (HT only)

Question 03

June 2024 | 8464/B/2H | Original Q6

0 6 Hormones are released from endocrine glands.

0 6 . 1 Which gland releases hormones to control other glands?

[1 mark]

Tick (✓) **one** box.

- Adrenal ☐
- Pituitary ☐
- Thyroid ☐

4.5.3.6 Feedback systems (HT only)

Question 03 · continued

Several hormones can affect blood glucose concentration.

0 6 . 2 Adrenaline can increase blood glucose concentration.

What is **one** other effect of adrenaline?

[1 mark]

Tick (✓) **one** box.

- Decreased breathing rate ☐
- Decreased metabolic rate ☐
- Increased blood flow to muscles ☐
- Increased FSH production ☐

0 6 . 3 Cells in the pancreas detect changes in blood glucose concentration.

What type of cell in the body detects changes?

[1 mark]

_____

Question 6 continues on the next page

4.5.3.6 Feedback systems (HT only)

Question 03 · continued

Scientists investigated whether blood glucose concentration affects reaction time.

The reaction times of ten people with Type 1 diabetes were measured.

This is the method used.

1. Tell one person to drink a glucose solution.
2. Monitor the person's blood glucose concentration.
3. Record the person's reaction time when the person's blood glucose concentration is:
   - 16 mmol/dm^3
   - 6 mmol/dm^3
   - 3 mmol/dm^3
4. Repeat steps 1 to 3 for the nine other people.

0 6 . 4 People with Type 1 diabetes were selected for the investigation instead of people who did **not** have diabetes.

Explain why.

[2 marks]

4.5.3.6 Feedback systems (HT only)

Question 03 · continued

0 6 . 5 Control variables between the different people in the investigation included:

- age
- sex
- food and drink consumed before and during the test.

Suggest **two other** control variables that should be used in the investigation.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 6 It was important for the scientists to monitor the health of each person during the investigation.

Suggest **one** reason why.

[1 mark]

_____

_____

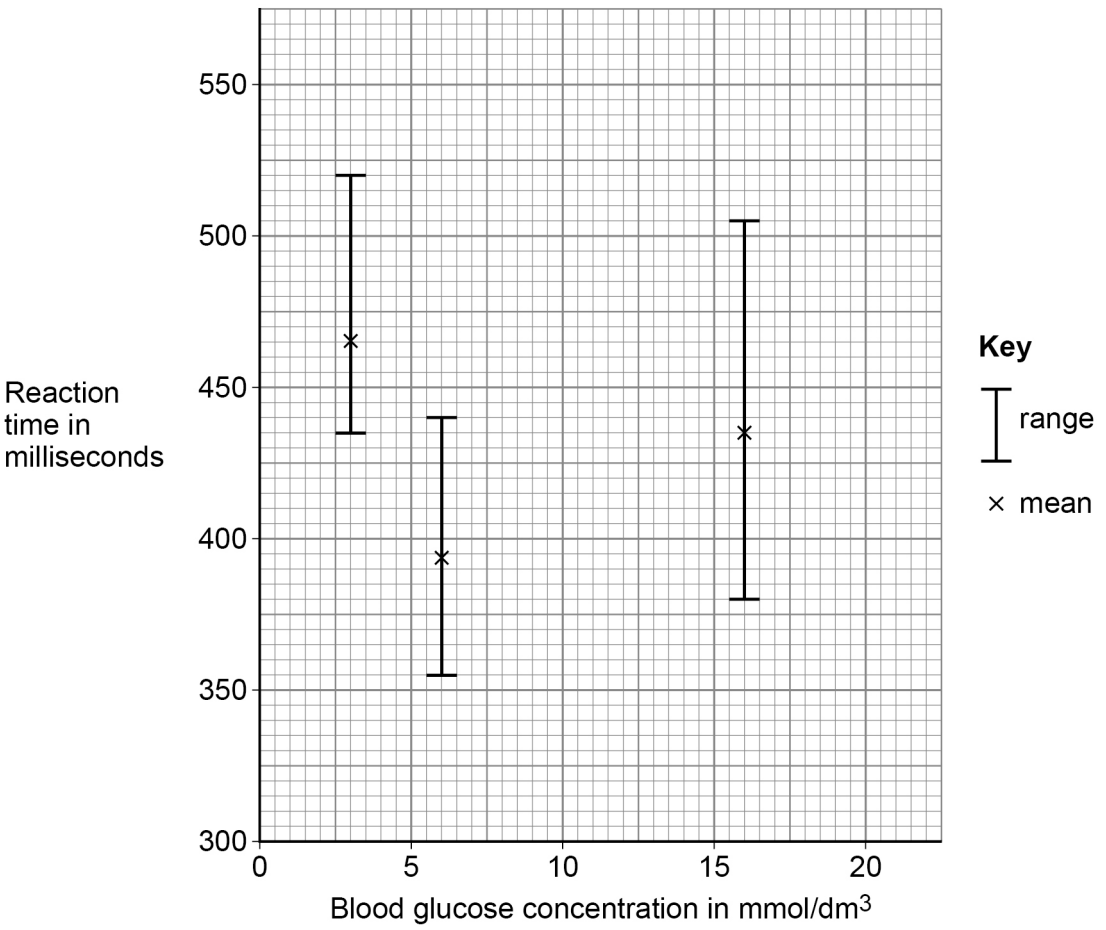
Question 6 continues on the next page

4.5.3.6 Feedback systems (HT only)

Question 03 · continued

Figure 6 shows the results.

Figure 6



0 6 . 7 People who do **not** have diabetes usually have a blood glucose concentration in the range of 4.0 mmol/dm^3 to 7.8 mmol/dm^3.

Describe how the results in **Figure 6** show the importance of homeostasis.

[2 marks]

4.5.3.6 Feedback systems (HT only)

Question 03 · continued

0 6 . 8 Describe how blood glucose concentration is maintained within narrow limits in people who do **not** have diabetes.

[5 marks]

0 6 . 9 The scientists gave the hypothesis:

‘Optimum blood glucose concentration increases the production of chemicals that diffuse across synapses.’

Describe how an increase in the chemicals could decrease reaction time.

[2 marks]

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