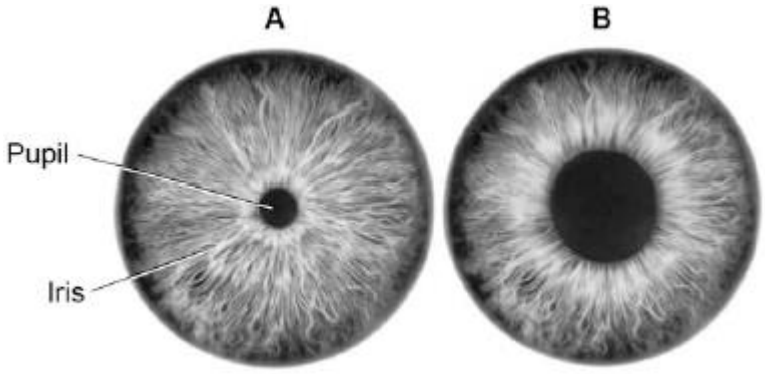
Q1.Figure 1 shows a reflex in the iris of the human eye in response to changes in light levels.

Figure 1



@ Gandee Vasan/Stone/Getty Images

(a) Describe the changes in the pupil and iris going from **A** to **B** in **Figure 1**.

Explain how these changes occur.

Refer to the changes in light level in your answer.

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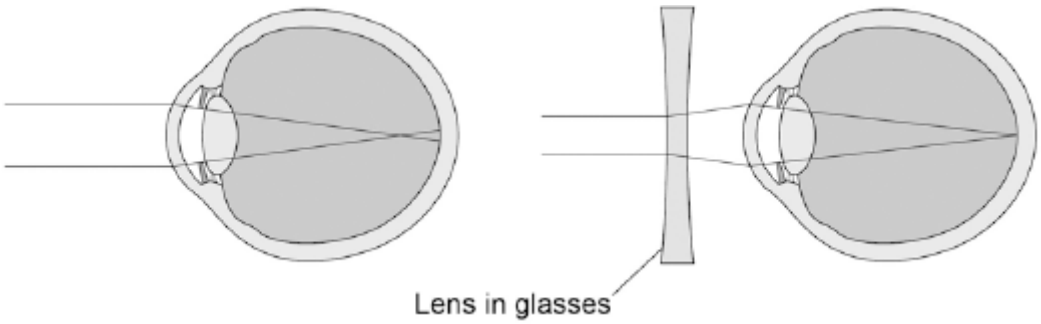
(4)

(b) Some people wear glasses to improve their vision.

Figure 2 shows light entering the eye in a person with blurred vision.

Figure 3 shows how this condition is corrected with glasses.

Figure 2 **Figure 3**



Compare **Figure 2** and **Figure 3**.

Explain how the blurred vision is corrected.

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(2)

(Total 6 marks)

Q2. Humans maintain an almost constant body temperature.

(a) Describe the role of blood vessels in the control of body temperature.

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(4)

(b) An athlete can run a marathon in 2 hours 15 minutes on a dry day in outside temperatures up to 35 °C.

If the air is dry, his body will **not** overheat.

In humid conditions the same athlete can run the marathon in the same time. However, in humid conditions, if the outside temperature goes over 18 °C then his body **will** overheat.

Suggest an explanation for the athlete overheating in humid conditions.

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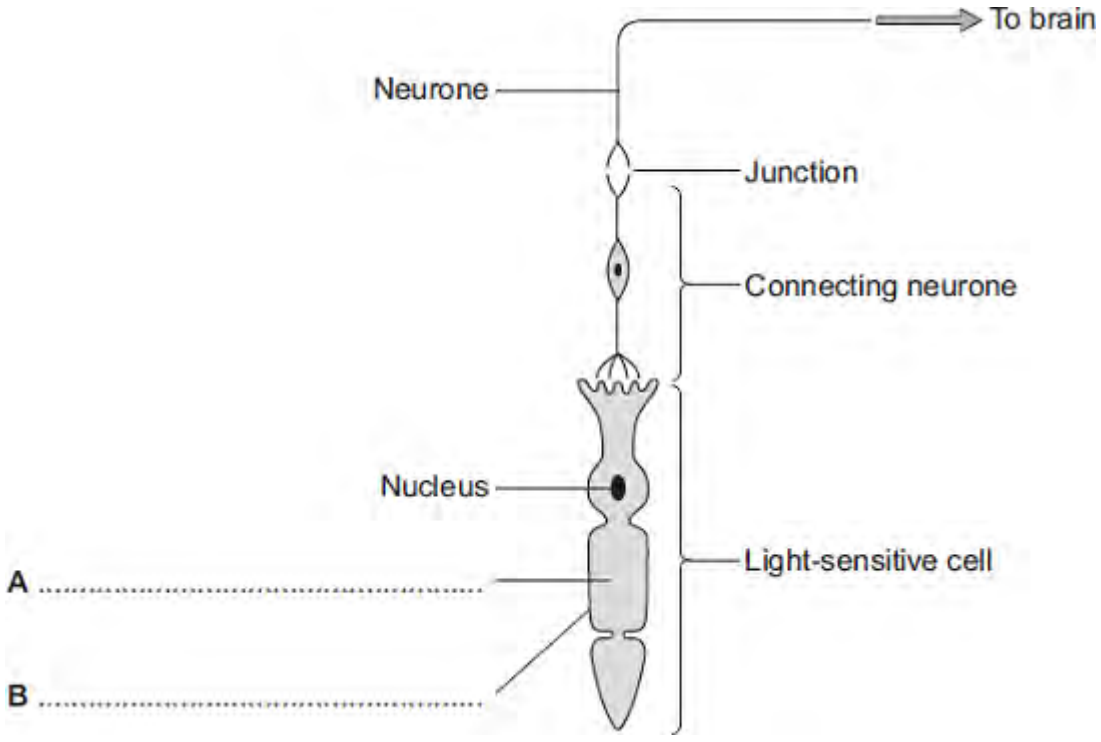
(3)
(Total 7 marks)

Q3.Diagram 1 shows cells from the light-sensitive layer in the eye.

Diagram 1



(a) On **Diagram 1**, add labels to name part **A** and part **B** of the light-sensitive cell.

(2)

(b) There is a junction between the connecting neurone and the neurone carrying the impulse to the brain.

(i) What name is given to the junction?

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(1)

(ii) In what form is information passed across the junction?

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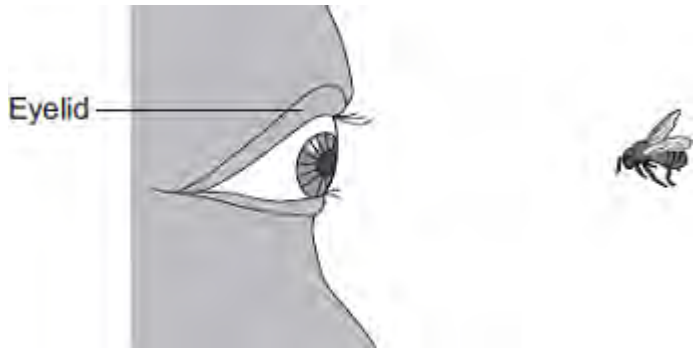
(1)

(c) Diagram **2** shows a bee flying towards a man's eye.



In the *blink reflex* , light from the bee reaches the light-sensitive cell in the eye. The muscles in the eyelid shut the man's eye before the bee hits the eye.

Describe the pathway taken by the nerve impulse in the *blink reflex*.

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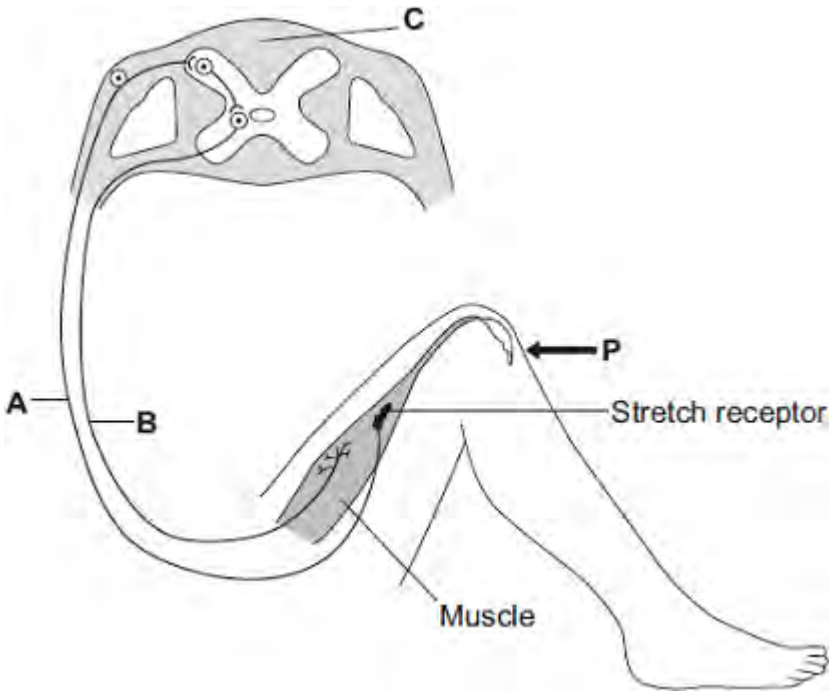
(4)
(Total 8 marks)

Q4. The diagram shows the structures involved in the knee-jerk reflex. When the person is hit at point **P**, the lower leg is suddenly raised.



(a) Name the structures labelled **A**, **B** and **C**.

A .....

B .....

C .....

(3)

(b) How is information passed across a synapse?

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(1)

(c) What is the effector in this response?

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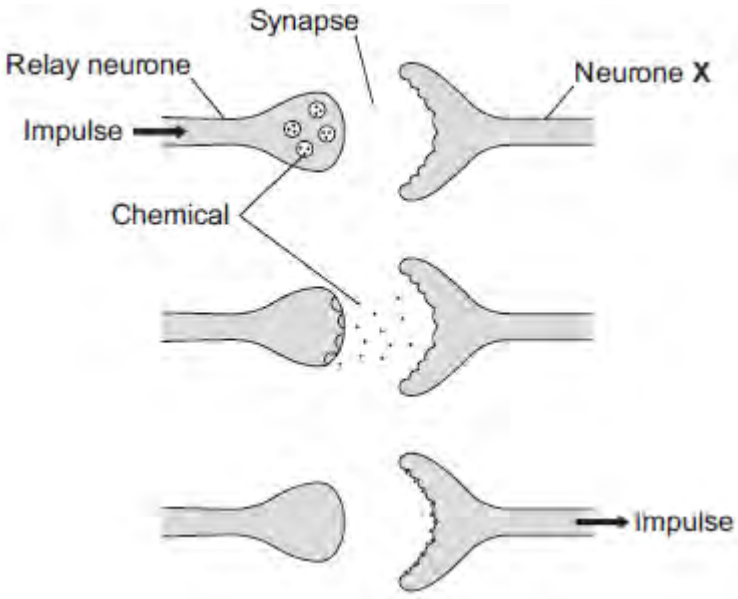
(1)

(Total 5 marks)

Q5. The diagram below shows how a nerve impulse passing along a relay neurone causes an impulse to be sent along another type of neurone, neurone **X**.



(a) What type of neurone is neurone **X**?

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(1)

(b) Describe how information passes from the relay neurone to neurone **X**. Use the diagram to help you.

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(3)

(c) Scientists investigated the effect of two toxins on the way in which information passes across synapses. The table below shows the results.

Toxin	**Effect at the synapse**
Curare	Decreases the effect of the chemical on neurone **X**
Strychnine	Increases the amount of the chemical made in the relay neurone

Describe the effect of each of the toxins on the response by muscles.

Curare .....

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Strychnine .....

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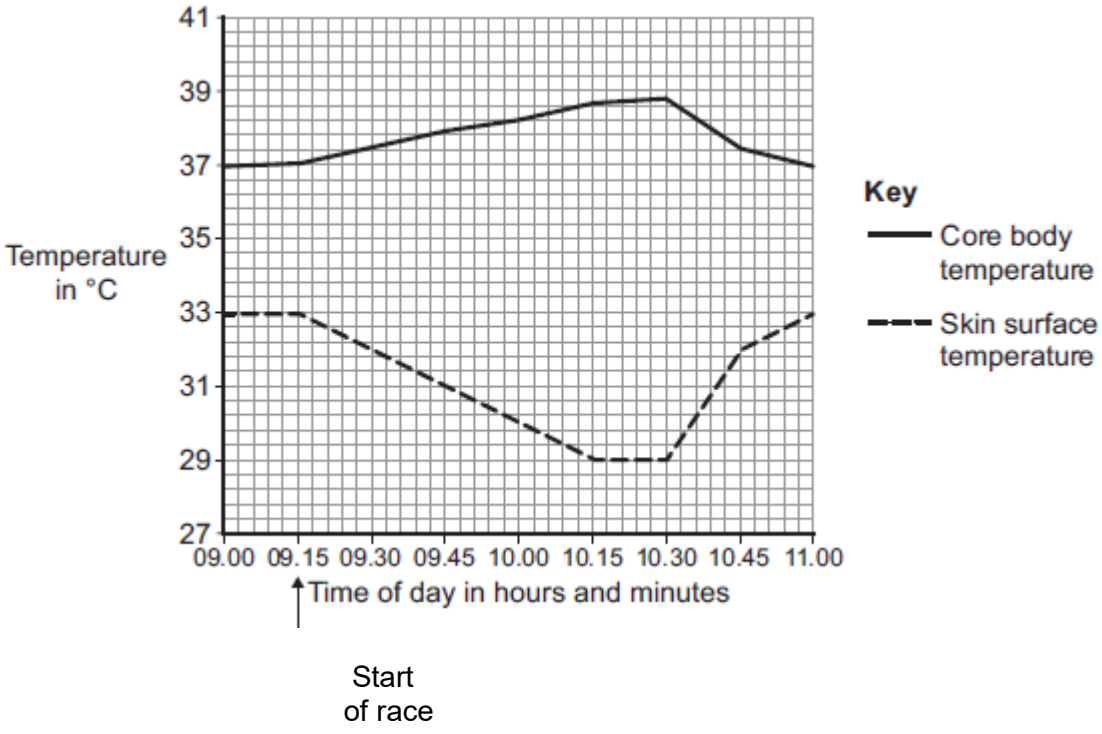
(2)
(Total 6 marks)

Q6. The graph shows the core body temperature and the skin surface temperature of a cyclist before, during and after a race.



(a) (i) When the cyclist finished the race, his core body temperature started to decrease.

How long did the race last?

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(1)

(ii) Describe and explain the different patterns shown in the core body temperature and skin surface temperature between 09.15 and 10.15.

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(6)

(iii) After 10.30, the core body temperature decreased.

Explain how changes in the blood vessels supplying the skin caused the skin surface temperature to increase.

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(2)

(b) During the race, the cyclist's blood glucose concentration began to decrease.

Describe how the body responds when the blood glucose concentration begins to decrease.

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(3)
(Total 12 marks)

Q7. Two students investigated reflex action times.

This is the method used.

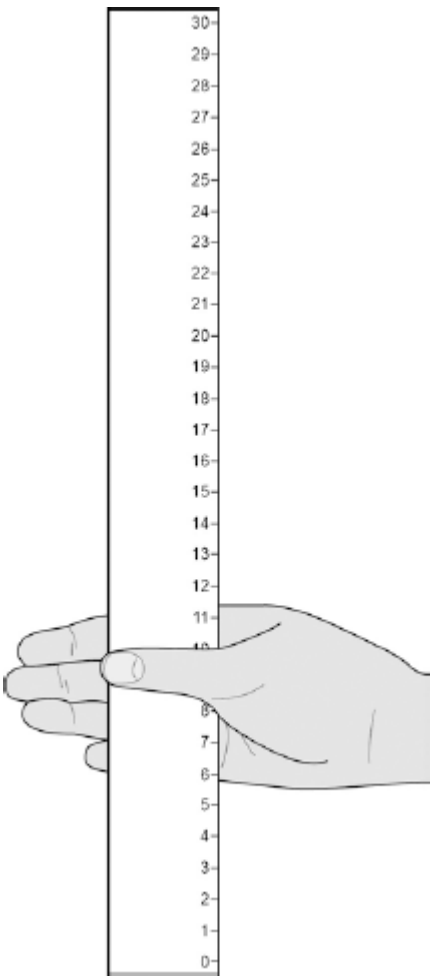
1. Student **A** sits with her elbow resting on the edge of a table.

2. Student **B** holds a ruler with the bottom of the ruler level with the thumb of Student **A**.

3. Student **B** drops the ruler.

4. Student **A** catches the ruler and records the distance, as shown in the diagram below.

5. Steps **1** to **4** were then repeated.



(a) Suggest **two** ways the students could improve the method to make sure the test would give valid results.

1 .....

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2 .....

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(2)

(b) The table below shows Student **A**'s results.

Test Number	Distance ruler dropped in mm
1	117
2	120
3	115
4	106
5	123
6	125
7	106

What is the **median** result?

Tick **one** box.

106 ☐

115 ☐

116 ☐

117 ☐

123 ☐

(1)

(c) The mean distance the ruler was dropped is 116 mm.

Calculate the mean reaction time.

Use the equation:

reaction time in s = $\sqrt{\frac{\text{mean drop distance in cm}}{490}}$

Give your answer to 3 significant figures

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Mean reaction time = ... s

(3)

(d) The students then measured Student **A**'s reaction time using a computer program.

This is the method used.

1. The computer shows a red box at the start.

2. As soon as the box turns green the student has to press a key on the keyboard as fast as possible.

3. The test is repeated five times and a mean reaction time is displayed.

Student **A**'s mean reaction time was 110 ms.

Using a computer program to measure reaction times is likely to be more valid than the method using a dropped ruler.

Give **two** reasons why.

1 .....

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2 .....

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(2)

(e) A woman has a head injury.

Her symptoms include:

- finding it difficult to name familiar objects
- not being able to remember recent events.

Suggest which part of her brain has been damaged.

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(1)

(f) A man has a head injury.

He staggers and sways as he walks.

Suggest which part of his brain has been damaged.

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(1)

(Total 10 marks)