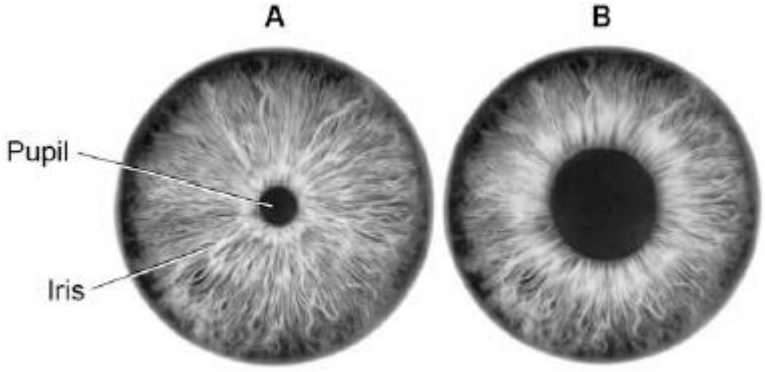
Q1.Figure 1 shows a reflex in the iris of the human eye in response to changes in light levels.

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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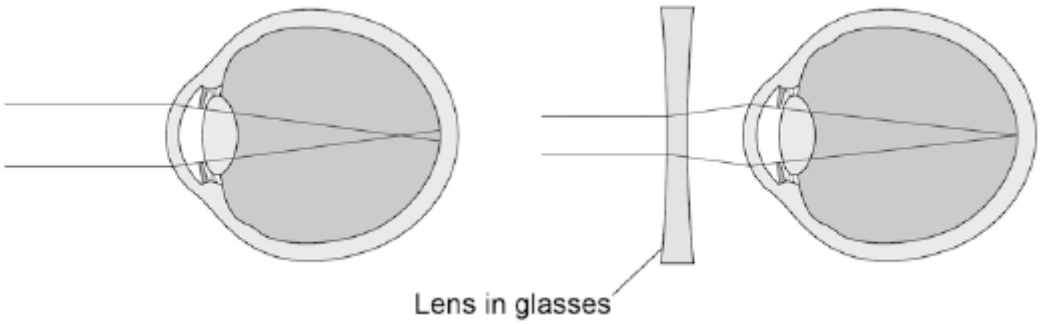
(4)

(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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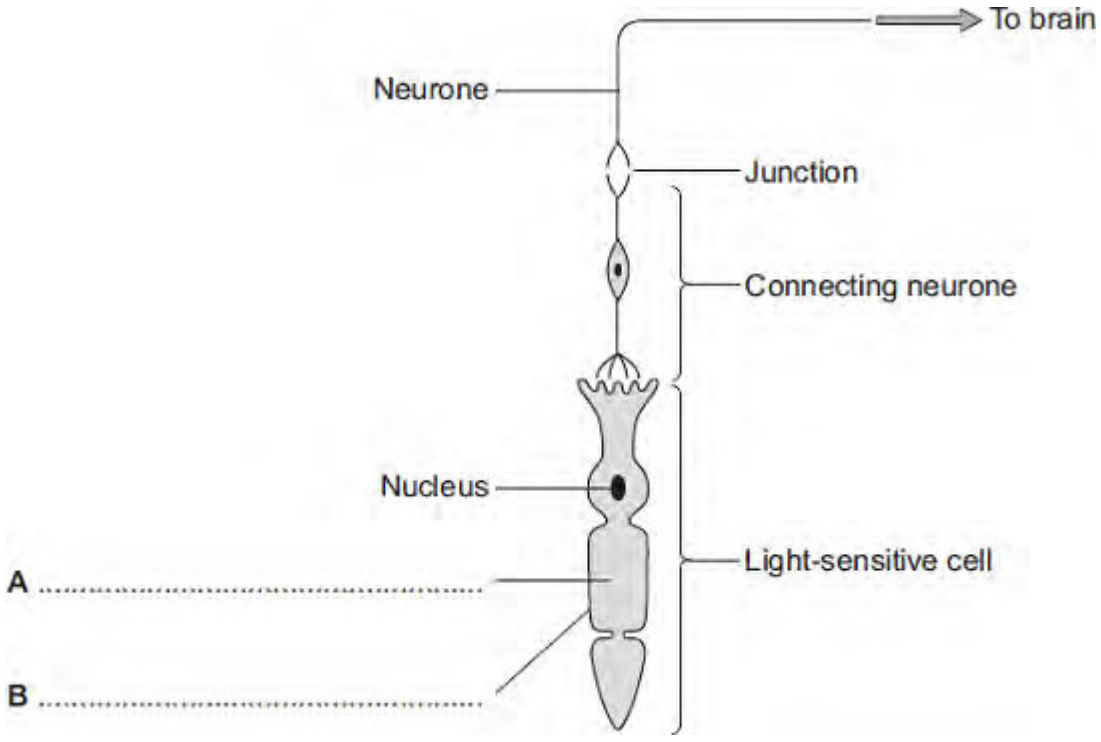
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(3)
(Total 7 marks)

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)

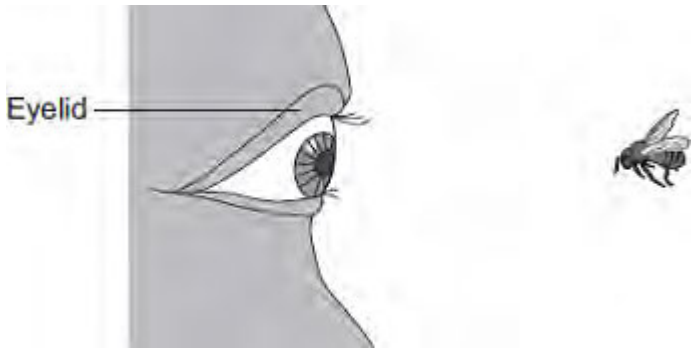
(ii) In what form is information passed across the junction?

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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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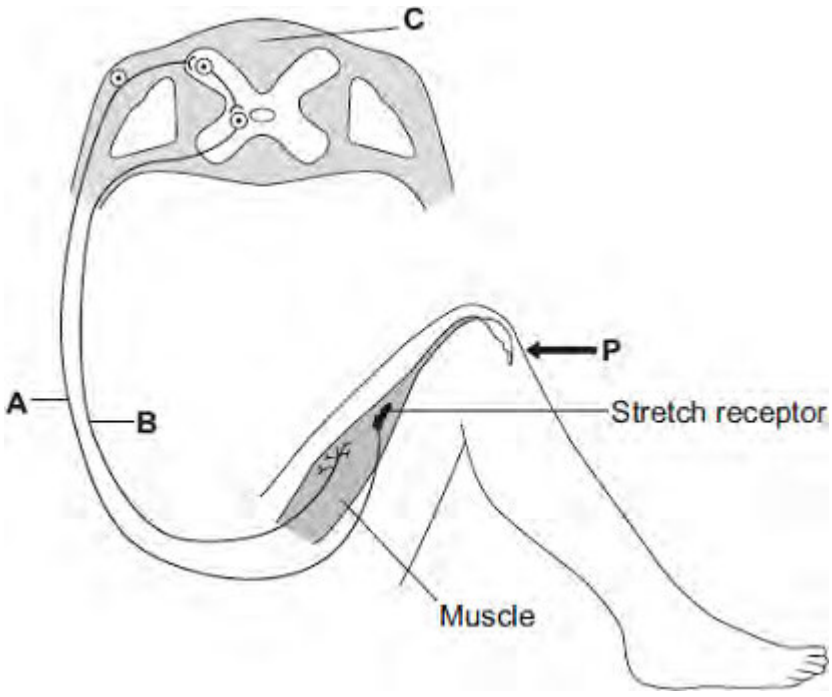
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(4)
(Total 8 marks)

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)

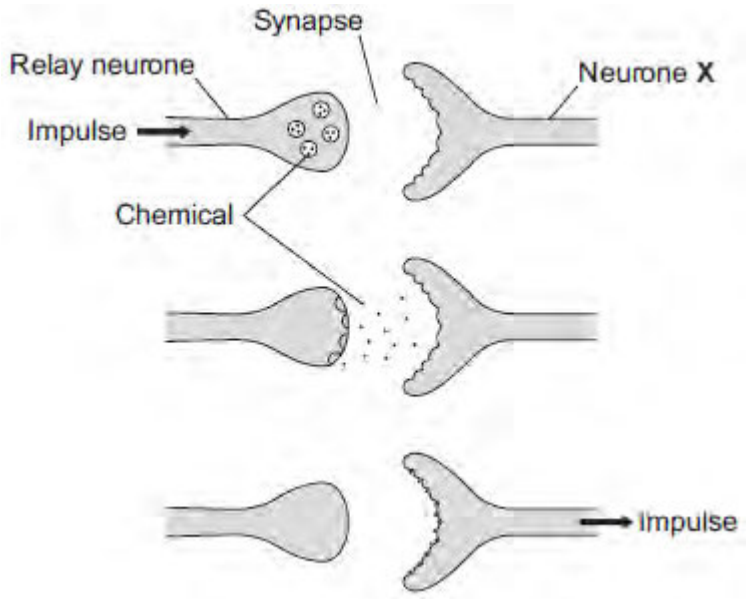
(c) What is the effector in this response?

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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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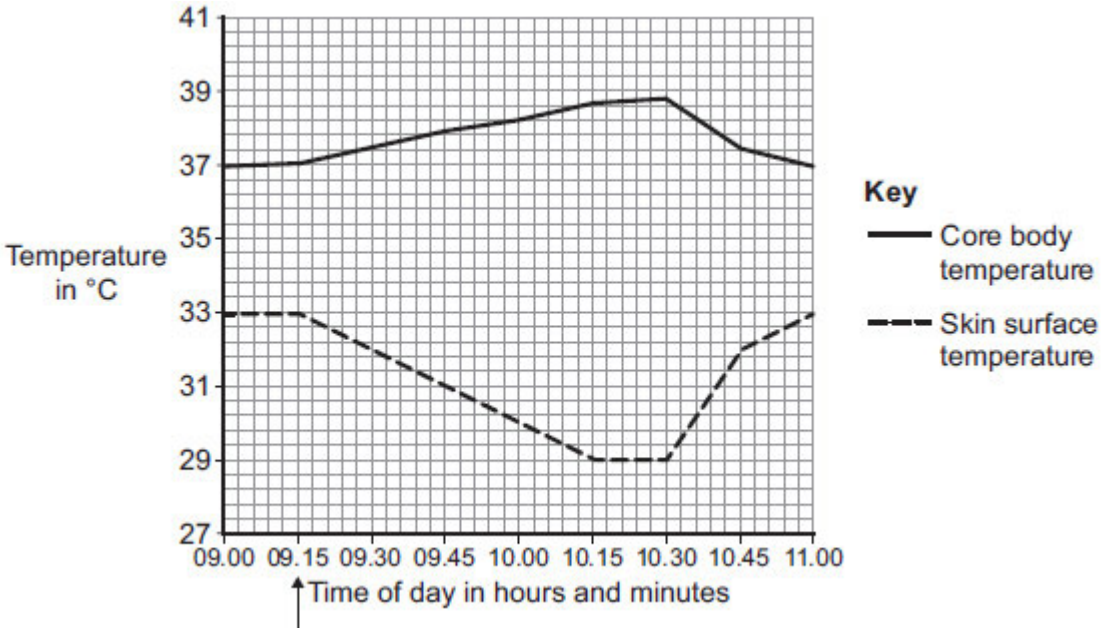
Strychnine .....

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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.

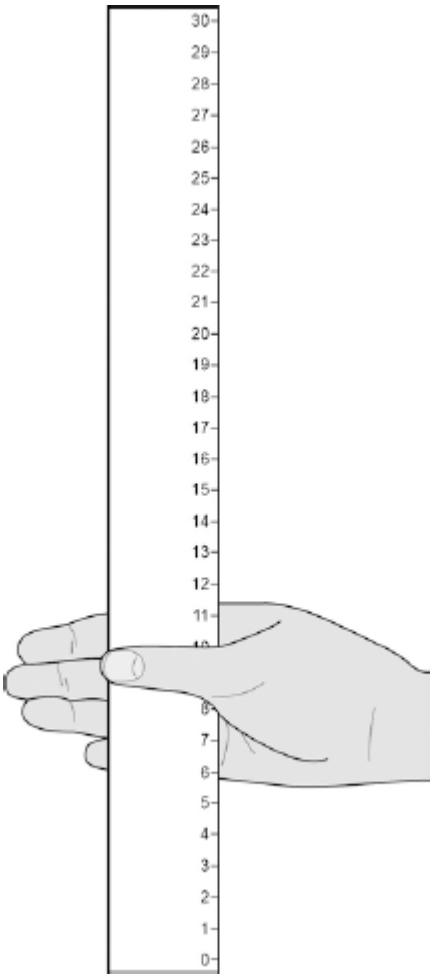
1. Student **A** sits with her elbow resting on the edge of a table.

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 .....

.....

(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)