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Level: IGCSE Oxford AQA Biology (9201)
Subject: Biology
Topic: IGCSE AQA Biology
Type: Topic Question

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Biology **IGCSE AQA**

Key skills

1. Many human actions are reflexes.

(a) Which **two** of the following are examples of reflex actions?

Tick **two** boxes.

Jumping in the air to catch a ball ☐

Raising a hand to protect the eyes in bright light ☐

Releasing saliva when food enters the mouth ☐

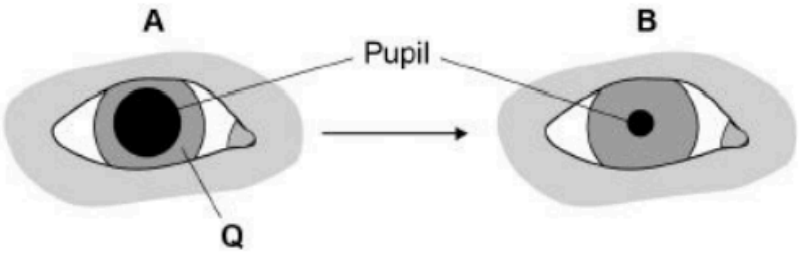
Running away from danger ☐

Withdrawing the hand from a sharp object ☐

(2)

Figure 1 shows how the size of the pupil of the human eye can change by reflex action.

Figure 1



(b) Name **one** stimulus that would cause the pupil to change in size from **A** to **B**, as shown in **Figure 1**.

_____

(1)

(c) Structure **Q** causes the change in size of the pupil.

Name structure **Q**.

_____

(1)

(d) Describe how structure Q causes the change in the size of the pupil from A to B.

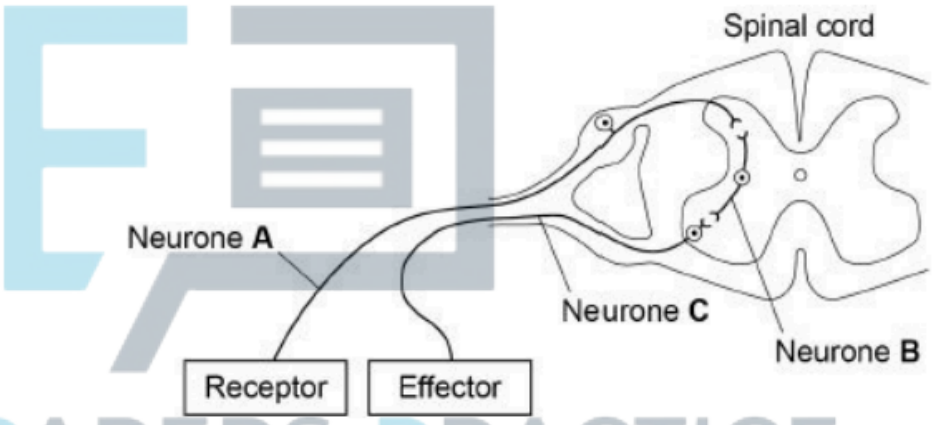
_____

_____

(1)

(e) Figure 2 shows some structures involved in the coordination of a reflex action.

Figure 2



Describe how the structures shown in Figure 2 help to coordinate a reflex action.

_____

_____

_____

_____

_____

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_____

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_____

(6)

(Total 11 marks)

2. Two students investigated reflex action times.

This is the method used.

1. Student **A** sits with his 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.
5. Steps **1** to **4** are then repeated.

The same method was also used with Student **A** dropping the ruler and Student **B** catching the ruler.

(a) Give two variables the students controlled in their investigation.

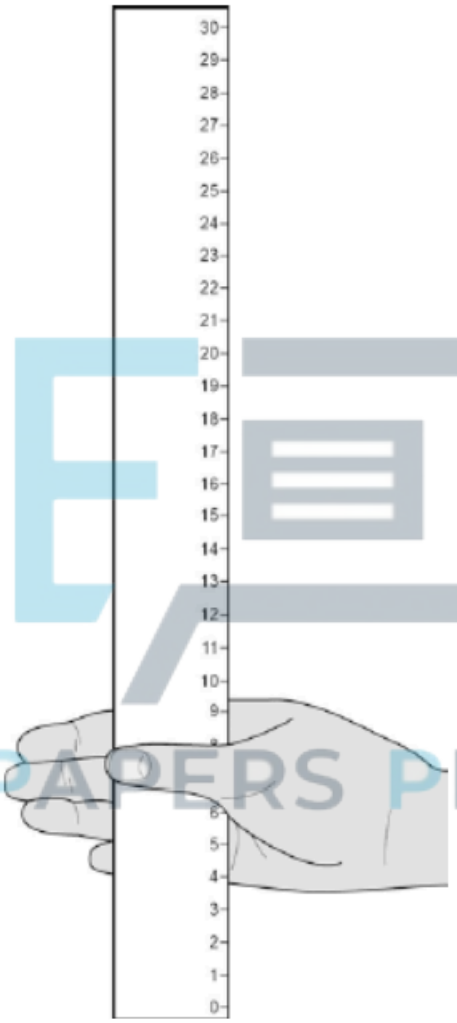
1. _____

2. _____

(2)

(b) **Figure 1** shows one of the results for the Student **A**.

Figure 1



What is the reading shown in **Figure 1**?

_____

Reading on ruler = _____ cm

(1)

(c) Table 1 shows the students' results.

Table 1

Test number	Distance ruler dropped in cm	
	Student A	Student B
1	9	12
2	2	13
3	6	13
4	7	9
5	7	8
Mean	**7**	**X**

Circle the anomalous result in **Table 1** for Student **A**.

(1)

(d) What is the **median** result for Student **B**?

Tick **one** box.

8 ☐

11 ☐

12 ☐

13 ☐

(1)

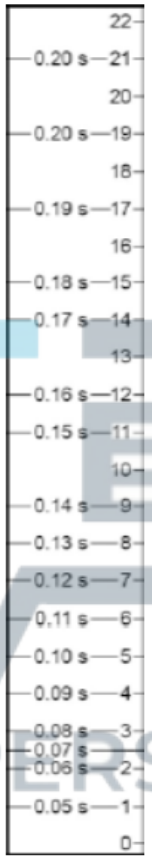
(e) Calculate the value of **X** in **Table 1**.

Mean distance ruler dropped = _____ cm

(1)

(f) **Figure 2** shows the scale used to convert distance of the ruler drop to reaction time.

Figure 2



Calculate how much faster the reaction time of Student A was compared to Student B.

Use **Figure 2** and **Table 1.**

_____

Answer = _____ s

(2)

(g) What improvement could the students make to the method so the results are more valid?

Tick **one** box.

- Use alternate hands when catching the ruler ☐
- Carry out more repeats ☐
- Use a longer ruler for catching ☐
- Use more than two students to collect results ☐

(1)

(h) Student **A** carried out a second investigation to see the effect of caffeine on the reflex action.

Table 2 shows his results.

Table 2

Test number	Distance ruler dropped in cm	
	Without caffeine	With caffeine
1	9	5
2	6	5
3	9	4
4	6	7
5	10	4
Mean	**8**	**5**

Give **one** conclusion about the effect of caffeine on reflex actions.

_____

_____

(1)

(Total 10 marks)

3. This question is about the nervous system.

(a) Describe the difference between the function of a receptor and the function of an effector.

In your answer you should give **one** example of a receptor and **one** example of an effector.

(4)

(b) Synapses are important in the nervous system.

(i) What is a synapse?

(2)

(ii) Describe how information passes across a synapse.

_____

_____

_____

_____

(2)

(c) Reflexes may be co-ordinated by the brain or by the spinal cord.

(i) The reflexes from sense organs in the head are co-ordinated by the brain.

Name a sense organ involved in a reflex co-ordinated by the spinal cord.

_____

(1)

(ii) The table shows information about reflexes co-ordinated by the brain and reflexes co-ordinated by the spinal cord.

Organ co-ordinating the reflex	Mean length of neurones involved in cm	Mean time taken for reflex in milliseconds	Mean speed of impulse in cm per millisecond
Brain	12	4	3
Spinal cord	80	50	

Calculate the mean speed of the impulse for the reflex co-ordinated by the spinal cord.

_____

_____

Mean speed = _____ cm per millisecond

(1)

(iii) In reflexes co-ordinated by the brain there are **no** relay neurones.

Suggest why there is a difference in the mean speed of the impulse for the two reflexes.

_____

_____

_____

_____

(2)

(Total 12 marks)

4. Humans use the nervous system to react to changes in the environment.

(a) (i) Which word means a change in the environment?

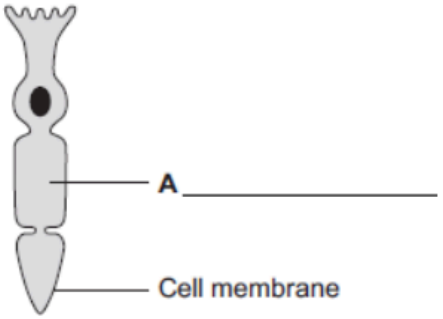
Draw a ring around the correct answer.

neurone **reflex** **stimulus**

(1)

(ii) **Figure 1** shows a light receptor cell.

Figure 1



Use the correct answer from the box to label part **A** on **Figure 1**.

chloroplast	**cytoplasm**	**vacuole**

(1)

(b) **Figure 2** shows a boy riding a bicycle on a sunny day.

Figure 2

© Stockbyte/Thinkstock

(i) Receptors in the boy's body detect changes in the environment.

Complete the table to show which organ of the body contains the receptors for each change in the environment.

Change in the environment	Organ that contains the receptors
Sound of traffic from behind him	
Flashing blue lights of a police car	
Cooler air temperature in the shadows	

(3)

(ii) The boy's response to danger is to pull on the bicycle brakes.

Which type of effector causes this response?

Tick (✓) **one** box.

A gland ☐

A muscle ☐

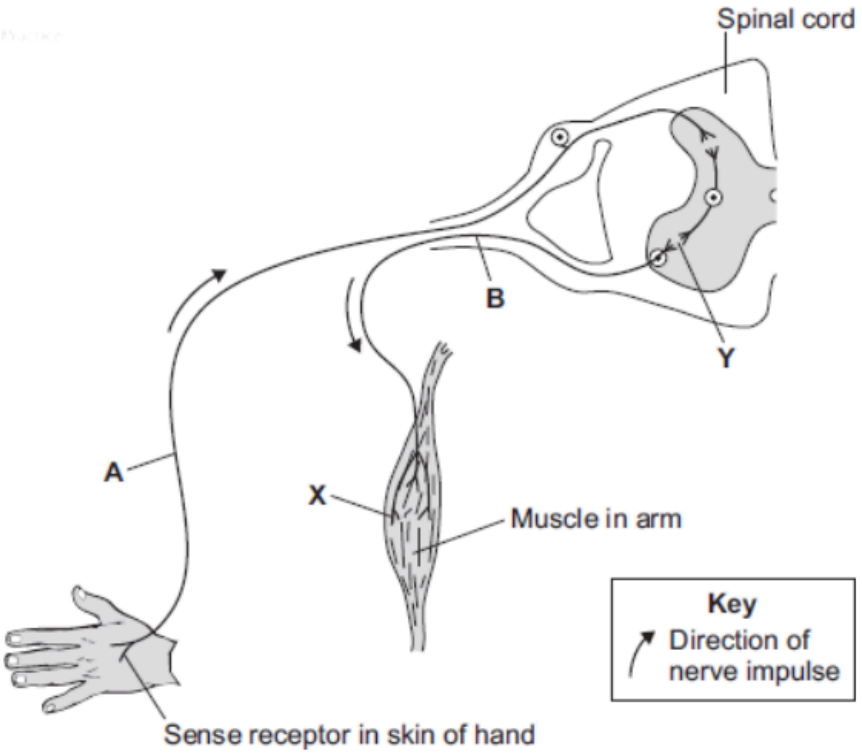
A synapse ☐

(1)

(Total 6 marks)

5. (a) **Diagram 1** shows the neurones and parts of the body involved in a response to touching a hot object.

Diagram 1



A neurone is a nerve cell. Neurones carry impulses around the body.

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

Neurone **A** is a

- motor neurone.
- relay neurone.
- sensory neurone.

At point **Y** there is a tiny gap between two neurones called

- an effector.
- a receptor.
- a synapse.

(2)

(ii) The hand touches a hot object. An impulse travels through the nervous system to the muscle (point **X**). The muscle moves the hand away from the hot object.

What does the muscle do to move the hand away from the hot object?

Tick (✓) **one** box.

- contract ☐
- relax ☐
- stretch ☐

(1)

(iii) The action described in part **(a) (ii)** is a reflex action.

How can you tell that this action is **not** a conscious action?

Use information from the diagram.

_____

_____

(1)

(iv) Reflex actions like this are useful.

Explain why.

_____

_____

_____

_____

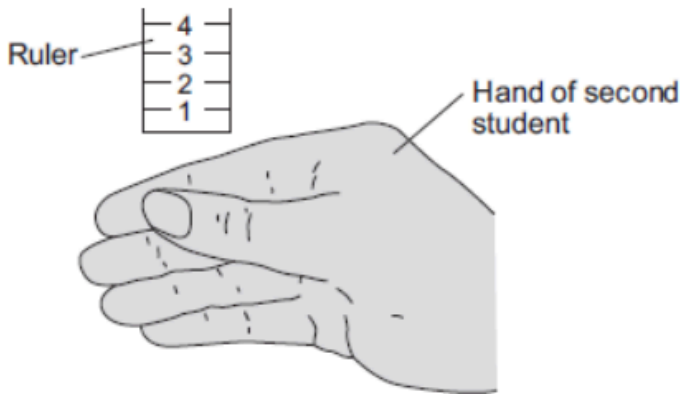
(2)

(b) Some students investigated the effect of caffeine on a person's reaction time.

The students used the following steps.

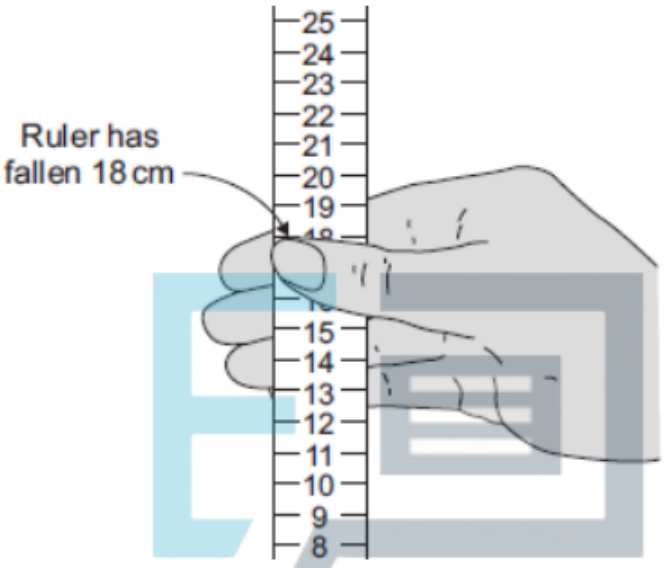
1. One student held a ruler just above a second student's hand, as shown in **Diagram 2**.

Diagram 2



2. The student let go of the ruler. The second student caught it as soon as possible, as shown in **Diagram 3**.

Diagram 3



3. The students repeated this experiment seven more times.

4. The student catching the ruler then drank a cup of strong coffee.

Coffee contains caffeine.

5. Fifteen minutes after drinking the coffee the students repeated steps 1 to 3.

Table 1 and **Table 2** show the students' results.

Table 1

Distance ruler fell before it was caught in cm
Before drinking coffee
18
21
25
15
19
16
12
21
Mean = 18.4

Table 2

Distance ruler fell before it was caught in cm
After drinking coffee
8
13
11
17
10
14
13
13
Mean = 12.4

(i) The students used the reading on the ruler as a measure of the reaction time.

What do the results show about the effect of caffeine on reaction time?

_____

_____

(1)

(ii) Look carefully at all the data in Table 1 and Table 2.

Using the data in Table 1 and Table 2, give one reason why a scientist may not accept your conclusion in part (b) (i).

_____

_____

(1)

(iii) How could the students improve their investigation?

Suggest two ways.

1. _____

_____

2. _____

_____

(2)

(Total 10 marks)