

# GCSE Biology

## Worksheet: Structure and function

|                |                   |                       |                            |
|----------------|-------------------|-----------------------|----------------------------|
| TIME<br>35 min | TOTAL<br>32 marks | CALCULATOR<br>Allowed | DIFFICULTY<br>Easy, Medium |
|----------------|-------------------|-----------------------|----------------------------|

Topics: Structure and function

NAME

CLASS

DATE

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

A student used the ruler-drop test to measure their reaction time. A partner held a ruler vertically just above the student’s open hand and dropped it without warning. The student caught the ruler as quickly as possible.

Table 1 shows the distance the ruler fell in five attempts.

Table 1

| Attempt                       | 1  | 2  | 3  | 4  | 5  |
|-------------------------------|----|----|----|----|----|
| Distance the ruler fell in cm | 13 | 11 | 17 | 13 | 16 |

0 1 . 1

Calculate the mean distance the ruler fell.

Mean distance = ..... cm

[2 marks]

Table 2

| Distance the ruler fell in cm | Reaction time in s |
|-------------------------------|--------------------|
| 8                             | 0.128              |
| 10                            | 0.143              |
| 12                            | 0.156              |
| 14                            | 0.169              |
| 16                            | 0.181              |
| 18                            | 0.192              |
| 20                            | 0.202              |

Table 2 is a conversion table for changing the distance the ruler fell into a reaction time.

Use Table 2 to find the student's mean reaction time.

.....

.....

.....

Mean reaction time = ..... s

**[1 mark]**

0 2

A student used a ruler-drop test five times. Table 3 shows the reaction time found from each attempt.

Table 3

| Attempt             | 1   | 2   | 3   | 4   | 5   |
|---------------------|-----|-----|-----|-----|-----|
| Reaction time in ms | 187 | 191 | 193 | 198 | 193 |

0 2 . 1

Calculate the student’s mean reaction time.

.....

.....

.....

.....

Mean reaction time = ..... ms

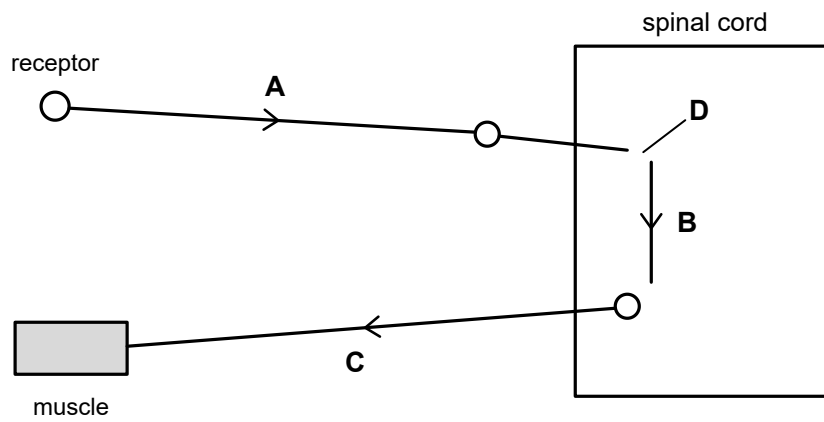
[2 marks]

\_\_\_\_\_

0 3

Figure 1 shows a reflex arc.

Figure 1



0 3 . 1

Name neurones **A**, **B** and **C**.

.....

.....

.....

.....

.....

.....

[3 marks]

0 3 . 2

What is the gap labelled **D**?

.....

.....

.....

.....

[1 mark]

0 3 . 3

Name the effector in Figure 1.

.....

.....

.....

[1 mark]

0 3 . 4

Which phrase describes reflex actions?

Tick (✓) **one** box.

Automatic and rapid

☐

Controlled by hormones

☐

Learned by practising

☐

Slow and conscious

☐

[1 mark]

0 4

A stimulus is detected by a receptor, and the nervous system coordinates a response.

0 4 . 1

What is a stimulus?

.....

.....

[1 mark]

0 4 . 2

In a reflex arc, which neurone connects a sensory neurone to a motor neurone in the spinal cord?

Tick (✓) **one** box.

Effector neurone

☐

Relay neurone

☐

Coordinator neurone

☐

Receptor neurone

☐

[1 mark]

0 4 . 3

Complete the sequence.

stimulus → receptor → ..... → ..... → response

.....

.....

.....

.....

[2 marks]

0 5

The blink reflex protects the eye. If an object approaches the eye quickly, or the surface of the eye (the cornea) is touched, the eyelid closes very quickly, without the person consciously deciding to blink.

0 5 . 1

Describe the pathway of nerve impulses in the blink reflex, from the receptor to the effector.

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

0 5 . 2

Explain why this reflex is important for protecting the eye.

.....

.....

.....

.....

[2 marks]

0 6

A student measured their reaction time using the ruler-drop test.

- A partner held a 30 cm ruler vertically, with the zero mark level with the top of the student's thumb.
- The partner dropped the ruler without warning.
- The student caught the ruler as quickly as possible.

Table 4 shows the distance the ruler fell in five attempts.

Table 4

| Attempt                   | 1  | 2  | 3  | 4  | 5  |
|---------------------------|----|----|----|----|----|
| Distance ruler fell in cm | 16 | 13 | 14 | 25 | 12 |

0 6 . 1

Which result is anomalous?

.....

.....

[1 mark]

0 6 . 2

Calculate the mean distance the ruler fell. Do **not** include the anomalous result.

.....

.....

.....

.....

Mean distance = ..... cm

[2 marks]

0 6 . 3

Suggest **one** reason for the anomalous result.

.....

.....

[1 mark]

0 6 . 4

Explain why a longer distance means a longer reaction time.

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[1 mark]

0 6 . 5

Give **two** variables that should be kept the same in each attempt.

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[2 marks]

0 7

The blink reflex causes the eyelid to close very quickly if the cornea is touched or an object approaches the eye. Tears also help to defend the eye.

0 7 . 1

Explain how the blink reflex and tear production could work together to protect the eye from a foreign particle, such as a speck of dust.

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[2 marks]

0 7 . 2

Suggest why it is an advantage that the blink reflex does not need input from the conscious part of the brain.

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[2 marks]

END OF QUESTIONS



# Mark scheme

## GCSE Biology · Worksheet: Structure and function · 32 marks

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### Question 1 (3 marks)

#### 01.1 [2 marks]

**Answer:** 14 cm

- $(13 + 11 + 17 + 13 + 16) \div 5$  (1)
  - 14 (cm) (1)
- 

#### 01.2 [1 mark]

**Answer:** 0.169 s

- 0.169 (s) (1)

**Notes:** Allow ECF: the time from Table 2 for an incorrect mean distance.

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### Question 2 (2 marks)

#### 02.1 [2 marks]

**Answer:** 192.4 ms

- $(187 + 191 + 193 + 198 + 193) \div 5$  (1)
  - 192.4 (ms) (1)
-

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### Question 3 (6 marks)

#### 03.1 [3 marks]

**Answer:** A sensory neurone; B relay neurone; C motor neurone

- A: sensory (neurone) (1)
  - B: relay (neurone) (1)
  - C: motor (neurone) (1)
- 

#### 03.2 [1 mark]

**Answer:** Synapse

- synapse (1)
- 

#### 03.3 [1 mark]

**Answer:** Muscle

- muscle (1)
- 

#### 03.4 [1 mark]

**Correct:** Automatic and rapid

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### Question 4 (4 marks)

#### 04.1 [1 mark]

- a change in the environment that can be detected and responded to (1)
- 

#### 04.2 [1 mark]

**Correct:** Relay neurone

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#### 04.3 [2 marks]

- coordinator (1)
  - effector (1)
-

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## Question 5 (6 marks)

### 05.1 [4 marks]

- receptors, e.g. in the cornea, detect the stimulus (1)
- impulses travel along a sensory neurone to the brain or spinal cord (CNS) (1)
- impulses pass, across a synapse, to a relay neurone and then along a motor neurone to the effector (1)
- the effector, a muscle in the eyelid, contracts, closing the eyelid (1)

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### 05.2 [2 marks]

- it happens automatically and very quickly (1)
  - it can close the eyelid before an object reaches, and damages, the eye, without needing time for conscious thought (1)
-

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## Question 6 (7 marks)

### 06.1 [1 mark]

**Answer:** Attempt 4 (25 cm)

- attempt 4 / 25 cm (1)

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### 06.2 [2 marks]

**Answer:** 13.75 cm

- $(16 + 13 + 14 + 12) \div 4$  (1)
- 13.75 / 13.8 (cm) (1)

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### 06.3 [1 mark]

- the student was distracted / not concentrating / blinked (1)
- the student's hand was in a different position (1)

Any 1 of the points above.

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### 06.4 [1 mark]

- the ruler falls for longer before it is caught (1)

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### 06.5 [2 marks]

- same hand (dominant hand) (1)
- same starting position of the ruler / zero level with the thumb (1)
- same gap between thumb and finger (1)
- same person dropping the ruler (1)
- no warning / same level of distraction (1)
- same ruler (1)

Any 2 of the points above.

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## Question 7 (4 marks)

### 07.1 [2 marks]

- the blink reflex quickly closes the eyelid, which can prevent the particle reaching the surface of the eye or reduce the force of impact (1)
- tears, produced by glands as an effector response, can then wash away any particle that does reach the eye (1)

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### 07.2 [2 marks]

- it can happen faster, because fewer neurones and synapses are involved and no time is used deciding whether to respond (1)
  - this gives the best chance of protecting the eye before it is damaged (1)
-