

GCSE Combined Science: Trilogy

Worksheet: Reaction time

TIME 30 min	TOTAL 28 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
-----------------------	--------------------------	------------------------------	-----------------------------------

Topics: Reaction time

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

0 1 . 1 Which of these is a typical reaction time for a driver?

Tick (✓) **one** box.

0.02 s

☐

0.5 s

☐

2.5 s

☐

5.0 s

☐

[1 mark]

0 1 . 2 Give **two** factors that can increase a driver's reaction time.

.....

.....

.....

.....

[2 marks]

0 1 . 3

A driver has a reaction time of 0.60 s and is travelling at 15 m/s.
Calculate the thinking distance.
Use the equation:
distance = speed × time

Thinking distance = m

[2 marks]

0 2

0 2 . 1

Which of these is a typical human reaction time?

Tick (✓) **one** box.

0.005 s

☐

0.25 s

☐

1.5 s

☐

4.0 s

☐

[1 mark]

0 2 . 2

Which **two** of these increase a driver's reaction time?

Tick (✓) **two** boxes.

Being well rested

☐

Drinking alcohol

☐

Concentrating fully on the road

☐

Being distracted by a mobile phone

☐

[2 marks]

0 3

Table 1 shows the mean reaction time of drivers in different age groups, from a road-safety study.

Table 1

Age group in years	Mean reaction time in s
18–25	0.53
26–40	0.58
41–60	0.65
61+	0.78

0 3 . 1

Describe the trend shown in Table 1.

.....

.....

[1 mark]

0 3 . 2

Calculate the thinking distance of a driver in the 61+ age group travelling at 15 m/s.

.....

.....

.....

.....

Thinking distance = m

[2 marks]

0 4

A student carries out the ruler-drop test to measure their reaction time.

0 4 . 1

Explain why the student should repeat the test several times and calculate a mean, rather than relying on a single reading.

.....

.....

.....

.....

[2 marks]

0 4 . 2

The student's five results are 0.18 s, 0.21 s, 0.19 s, 0.55 s and 0.20 s. Identify the anomalous result.

.....

.....

[1 mark]

0 4 . 3

Calculate the mean of the remaining results.

.....

.....

.....

.....

Mean reaction time = s

[2 marks]

.....

0 5

A road-safety group tested the reaction times of drivers in a driving simulator. Table 2 shows the mean results.

Table 2

Condition	Mean reaction time in s
No distraction	0.55
Talking on a hands-free phone	0.92
Reading a text message	1.40

0 5 . 1

Calculate the increase in thinking distance for a driver travelling at 31 m/s who is talking on a hands-free phone, compared with a driver who has no distraction.

.....

.....

.....

.....

.....

Increase in thinking distance = m

[3 marks]

0 5 . 2

A student concludes:
'Talking on a hands-free phone doubles a driver's thinking distance.'
Evaluate this conclusion.

.....

.....

.....

.....

[2 marks]

0 5 . 3

Suggest **one** reason why the results from the simulator may not apply to all drivers on real roads.

.....

.....

[1 mark]

0 6

A student measured their reaction time with the ruler-drop test. A partner held a ruler vertically and let go of it without warning. The student caught the ruler as quickly as possible and the distance the ruler fell was recorded. Table 3 shows the results.

Table 3

Trial	1	2	3	4	5
Distance fallen in cm	14.2	16.0	12.8	25.0	15.0

0 6 . 1

Identify the anomalous result.

.....

.....

.....

Anomalous result = cm

[1 mark]

0 6 . 2

Calculate the mean distance fallen, ignoring the anomalous result.

.....

.....

.....

.....

Mean distance = cm

[2 marks]

0 6 . 3

Table 4

Distance fallen in cm	5	10	15	20	25
Reaction time in s	0.10	0.14	0.17	0.20	0.23

Table 4 shows how the distance fallen is related to the reaction time.
Use Table 4 to estimate the student's reaction time.

.....

.....

.....

Reaction time = s

[1 mark]

0 6 . 4

Explain why a driver's reaction time in an emergency is usually longer than the reaction time measured in this test.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Reaction time · 28 marks

Question 1 (5 marks)

01.1 [1 mark]

Correct: 0.5 s

01.2 [2 marks]

Answer: Any two of: tiredness, alcohol, drugs, distractions.

- tiredness (1)
- drinking alcohol (1)
- taking (some) drugs (1)
- distractions, e.g. using a mobile phone (1)

Any 2 of the points above.

01.3 [2 marks]

Answer: 9.0 m

- $s = 15 \times 0.60$ (1)
 - 9.0 (m) (1)
-

Question 2 (3 marks)

02.1 [1 mark]

Correct: 0.25 s

02.2 [2 marks]

Correct: Drinking alcohol; Being distracted by a mobile phone

Question 3 (3 marks)

03.1 [1 mark]

Answer: Mean reaction time increases with age group.

- mean reaction time increases with age group (1)
-

03.2 [2 marks]

Answer: 11.7 m

- $s = 15 \times 0.78$ (1)
 - 11.7 (m) (1)
-

Question 4 (5 marks)

04.1 [2 marks]

Answer: A single reading may be untypical or anomalous; a mean of repeats reduces the effect of random variation.

- a single reading could be affected by random variation (for example a lapse in concentration), so it may not be typical / could be anomalous (1)
 - repeating and calculating a mean reduces the effect of random variation, giving a more reliable value (1)
-

04.2 [1 mark]

Answer: 0.55 s.

- 0.55 s (1)
-

04.3 [2 marks]

Answer: 0.20 s (0.195 s)

- $(0.18 + 0.21 + 0.19 + 0.20) \div 4$ (1)
 - 0.20 (s) (0.195) (1)
-

Question 5 (6 marks)

05.1 [3 marks]

Answer: 11 m (11.5 m)

- increase in reaction time = $0.92 - 0.55 = 0.37$ (s) (1)
 - increase in thinking distance = 31×0.37 (1)
 - 11 (m) (1)
-

05.2 [2 marks]

Answer: Thinking distance $\propto$ reaction time; $0.92 \div 0.55 \approx 1.7$, so it increases by about 70%, not double.

- thinking distance is proportional to reaction time, and $0.92 \div 0.55 = 1.7$ (1)
 - so the thinking distance increases by about 70%, not 100% (the conclusion is not supported) (1)
-

05.3 [1 mark]

Answer: Reaction times vary from person to person, so the sample may not represent all drivers.

- reaction times vary from person to person, so the sample may not be representative (1)
- drivers in a simulator may be expecting a hazard / behave differently from real driving (1)
- other factors, such as tiredness, alcohol or drugs, were not tested (1)

Any 1 of the points above.

Question 6 (6 marks)

06.1 [1 mark]

Answer: 25.0 cm (trial 4)

- 25.0 (cm) / trial 4 (1)
-

06.2 [2 marks]

Answer: 14.5 cm

- $(14.2 + 16.0 + 12.8 + 15.0) \div 4$ (1)
 - 14.5 (cm) (1)
-

06.3 [1 mark]

Answer: 0.17 s

- 0.17 (s) (allow 0.16–0.18) (1)
-

06.4 [2 marks]

Answer: In the test the student is ready and waiting; a driver must notice the hazard, decide and move their foot to the brake.

- in the test the student is concentrating on / expecting the ruler to drop (1)
 - a driver must first notice the hazard and decide to brake / move their foot to the brake pedal (1)
-