AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.5.4.1.4

The distance–time relationship

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**4**
Available paper years	**2020–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

6.5.4.1.4 The distance–time relationship

Answer 01 · Mark scheme

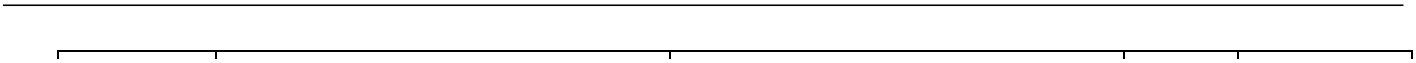
November 2020 | 8464/P/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	gradient = $\frac{250 - 0}{50 - 0}$ speed = 5.0 m/s	allow any correct pair of values substituted allow 5 (m/) allow the use of s = v t	1 1	AO2 6.5.4.1.4
04.2	gravitational force		1	AO1 6.5.1.2
04.3	W = 30 × 250 W = 7500 J		1 1 1	AO2 AO2 AO1 6.5.2
04.4	frictional kinetic chemical		1 1 1	AO1 6.5.2
Total			**9**	

6.5.4.1.4 The distance–time relationship

Answer 01 · Mark scheme

November 2020 | 8464/P/2F | Original Q4



6.5.4.1.4 The distance–time relationship

Answer 02 · Mark scheme

June 2023 | 8464/P/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	the line is straight		1	AO2 6.5.4.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	64 **and** 84 read from graph braking distance = 20 (m)	 do not accept if readings from the graph are incorrect	1 1	AO3 6.5.4.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	$a = \frac{16}{2.5}$ a = 6.4 (m/s^2)	 ignore negative signs	1 1	AO2 6.5.4.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	the brakes on the car can overheat the driver may lose control of the car		1 1	AO1 6.5.4.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	the greater the speed the greater the braking distance		1	AO1 6.5.4.3.1

Total Question 2	**8**

6.5.4.1.4 The distance–time relationship

Answer 03 · Mark scheme

June 2025 | 8464/P/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	distance travelled = 3.0 × 20 distance travelled = 60 (m)	both marks may be awarded if a length in the range 2.9 to 3.1 cm is used	1 1	AO3 6.5.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	weight = 15 × 9.8 weight = 147 (N)	 allow weight = 150 (N)	1 1	AO2 6.5.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	the line has a constant gradient	allow the line is straight do **not** accept directly proportional	1	AO2 6.5.4.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	distance travelled = $\frac{4500}{250}$ distance travelled = 18 (m)		1 1	AO2 6.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	total distance travelled is greater than the displacement		1	AO1 6.5.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	distance has magnitude only		1	AO1 6.5.1.1 6.5.4.1.1

6.5.4.1.4 The distance–time relationship

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	total distance = 158 (km)	allow **1** mark for 56, 40 and 62 read from graph allow **1** mark for a total distance calculated using two correct values and one incorrect value from the bar chart	2	AO3 6.5.4.1.4

Total Question 3	**11**

6.5.4.1.4 The distance–time relationship

Answer 04 · Mark scheme

June 2025 | 8464/P/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	distance travelled = speed × time		1	AO1 6.5.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	1 500 000 = v × 670 000 $v = \frac{1\ 500\ 000}{670\ 000}$ V = 2.2… (m/s)		1 1 1	AO2 6.5.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	F = (6 × 370) - 520 F = 1700 (N)	if no other mark awarded allow **1** mark for 370 - 520 = (-)150 (N)	1 1	AO2 6.5.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	speed	allow velocity	1	AO1 6.5.4.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	friction + air resistance = pull of the rope on the sled		1	AO1 6.5.1.4 6.5.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	the force of the sled on the rope		1	AO1 6.5.4.2.3

Total Question 6	9

6.5.4.1.4 The distance–time relationship

Answer 02 · Examiner comments June 2023 | 8464/P/2F | Original Q2

Question 2 (Low demand)

02.1 Approximately 65% of students knew that the line being straight showed that the speed was constant.

02.2 Only 40% of students interpreted the question correctly. Nearly every student that correctly read the values from the graph gave the correct braking distance.

02.3 Nearly 90% of students correctly calculated the deceleration.

02.4 A little over 20% of students selected the two correct answers. 60% of students gained one mark for one correct answer. A significant number of students only ticked one box.

02.5 20% of students were able to describe the relationship. Most correct answers stated that increasing speed increases the braking distance. Many students wrote vague statements such as ‘it increases’ or ‘speed increases the braking distance’.

6.5.4.1.4 The distance–time relationship

Answer 03 · Examiner comments June 2025 | 8464/P/2F | Original Q3

Question 3 (Low demand)

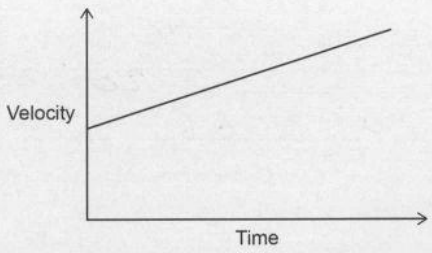
03.1 Almost two thirds of students were able to interpret the scale on the diagram and arrive at a correct answer.
Some students calculated the correct distance but then contradicted this by multiplying their answer by 20, which prevented them from scoring any marks.

03.2 The majority of students answered this calculation correctly. A small proportion of students decided that the unit for mass should be grams and ended up with an answer that was too large by a factor of a thousand, so were unable to gain one of the marks.

03.3 Only about 4 in 10 students were able to state that gradient was constant or that the line was straight, to gain the mark. Some students struggled to express the idea of a constant gradient, giving answers such as 'the line is straight and moves at a constant speed', or just giving a description of acceleration instead of referring to the graph.

0 3 . 3 **Figure 6** shows a velocity–time graph for a downhill part of the journey.

Figure 6



The gradient of the graph represents acceleration.

How does **Figure 6** show that the acceleration was constant?

[1 mark]

A straight line with a constant velocity

A proportion of incorrect answers were contradictory, by stating that the straight line had a constant velocity or a constant speed.

03.4 About 90% of students correctly calculated the distance travelled.

03.5 Nearly two thirds of students were able to identify how distance compared with displacement for the cyclist.

03.6 Only about a third of students selected the correct reason for distance being a scalar quantity.

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6.5.4.1.4 The distance–time relationship

Answer 03 · Examiner comments June 2025 | 8464/P/2F | Original Q3

3.7 About three quarters of students correctly determined the total distance travelled by the cyclist. Incorrect answers were often caused by misinterpreting the scale on the graph and reading, for example, 53 km instead of 56 km for the distance travelled on the Monday.

Answer 04 · Examiner comments June 2025 | 8464/P/2F | Original Q6

Question 6 (Standard demand)

06.1 Approximately 90% of students were either able to recall the equation linking distance, speed and time, or used the Physics Equations Sheet to look it up.

06.2 Nearly two thirds were able to correctly rearrange the equation selected and arrive at the correct answer. This was perhaps aided by some students recalling the equation as 'speed = distance / time' and arriving at the correct answer using this memorised form of the equation rather than by re-arranging the equation they selected in the previous question.

0 6 . 2 The longest dog-sled race in the world covers a distance of 1 500 000 m.