AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.5.4.3.1

Stopping distance

Past-paper questions

Tier	**Higher**
Question groups	**6**
Available paper years	**2018–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

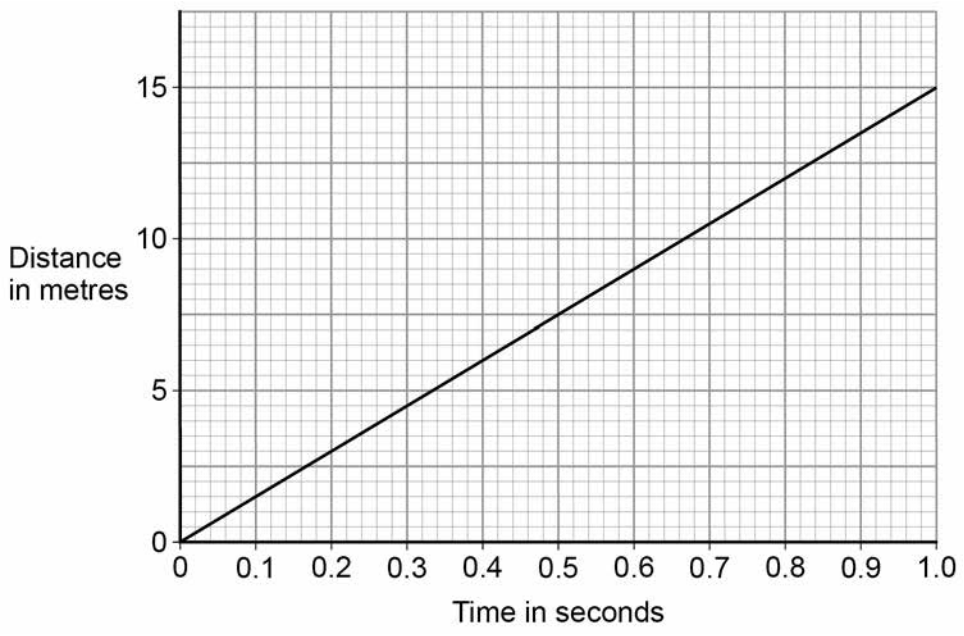
6.5.4.3.1 Stopping distance

Question 01

June 2018 | 8464/P/2H | Original Q6

0 6 . 1 **Figure 8** shows the distance-time graph for a car travelling at 15 m/s

Figure 8



When the driver is tired, his reaction time increases from 0.50 seconds to 0.82 seconds.

Determine the **extra** distance the car would travel before the driver starts braking.

[2 marks]

Distance = _____ m

0 6 . 2 When the brakes are used, the temperature of the brakes increases.

Explain why. Use ideas about energy in your explanation.

[2 marks]

Question 6 continues on the next page

6.5.4.3.1 Stopping distance

Question 01 · continued

0 6 . 3 A lorry travels 84 m with a constant acceleration of 2.0 m/s^2 to reach a velocity of 19 m/s

Calculate the initial velocity of the lorry.

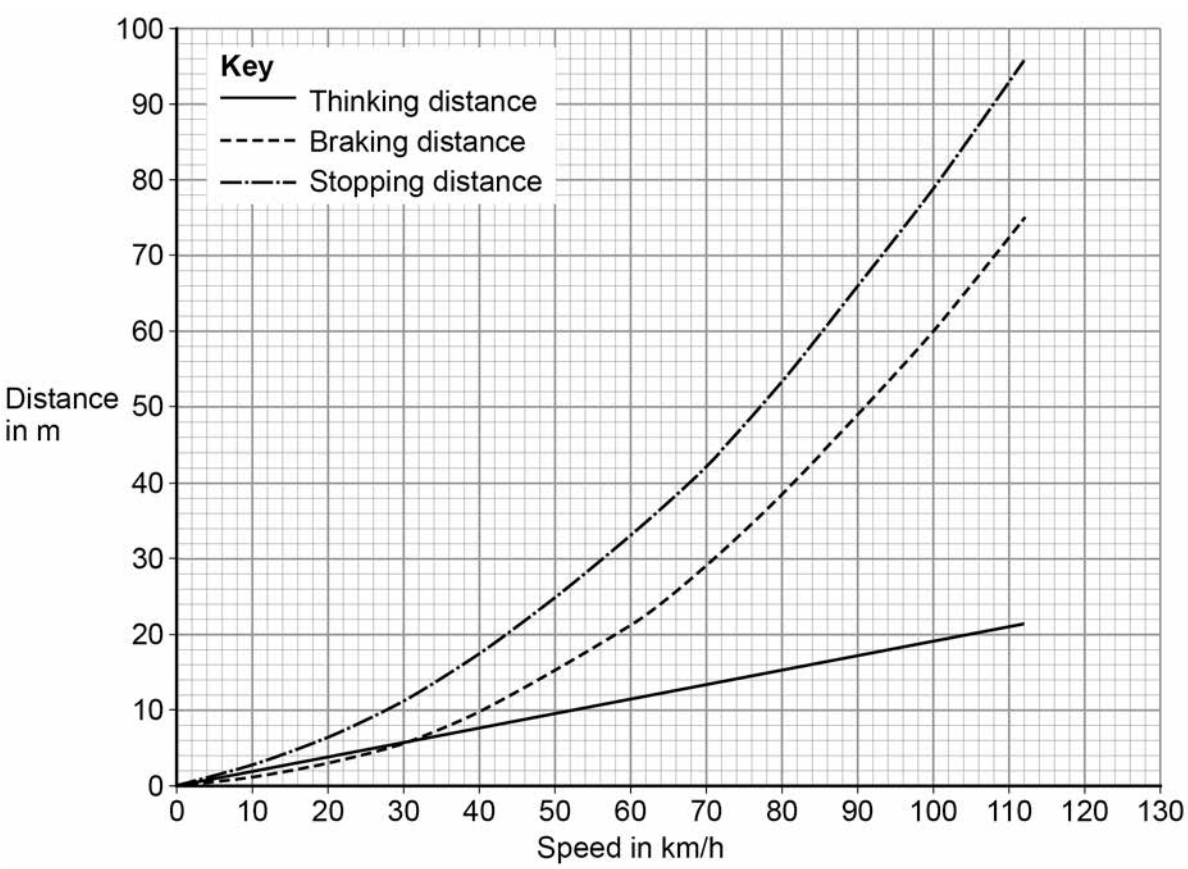
Use the Physics Equations Sheet.

[3 marks]

Initial velocity = _____ m/s

0 6 . 4 **Figure 9** shows how the thinking distance, braking distance and stopping distance for a car vary with the speed of the car.

Figure 9



6.5.4.3.1 Stopping distance

Question 01 · continued

Describe the relationships shown in **Figure 9**

You should include factors that would affect the gradient of the lines.

[6 marks]

13

6.5.4.3.1 Stopping distance

Question 02

November 2020 | 8464/P/2H | Original Q6

0 6 The speed limit on many roads in towns is 13.5 m/s

Outside schools this speed limit is often **reduced by** one-third.

0 6 . 1 Calculate the reduced speed limit.

[2 marks]

Reduced speed limit = _____ m/s

0 6 . 2 A reduced speed limit may reduce air pollution.

Explain **one** other advantage of a reduced speed limit.

[2 marks]

Question 6 continues on the next page

6.5.4.3.1 Stopping distance

0 6 . 3 **Figure 11** shows a car being driven at a constant speed past a speed camera.

Figure 11



The camera recorded two images of the car 0.70 s apart.

The car travelled 14 m between the two images being taken.

The maximum deceleration of the car is 6.25 m/s^2

Calculate the minimum braking distance for the car at the speed it passed the speed camera.

[6 marks]

Minimum braking distance = _____ m

6.5.4.3.1 Stopping distance

Question 02 · continued

0 6 . 4 **Figure 12** shows a delivery van full of packages.

Figure 12



The driver delivers all the packages.

The empty van has a shorter stopping distance than the full van when driven at the same speed.

Explain why.

[3 marks]

13

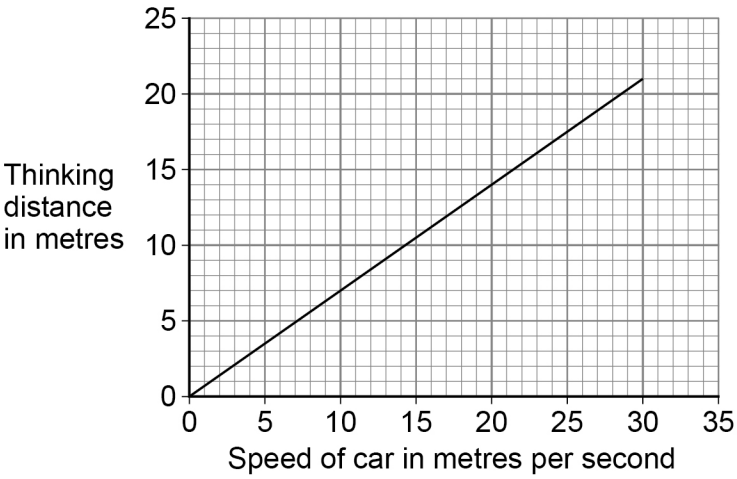
6.5.4.3.1 Stopping distance

Question 03

0 6 The distance a car travels during the driver's reaction time is called the thinking distance.

0 6 . 1 **Figure 9** shows how thinking distance depends on speed for a car.

Figure 9



Determine the driver's reaction time.

Use the Physics Equations Sheet.

[3 marks]

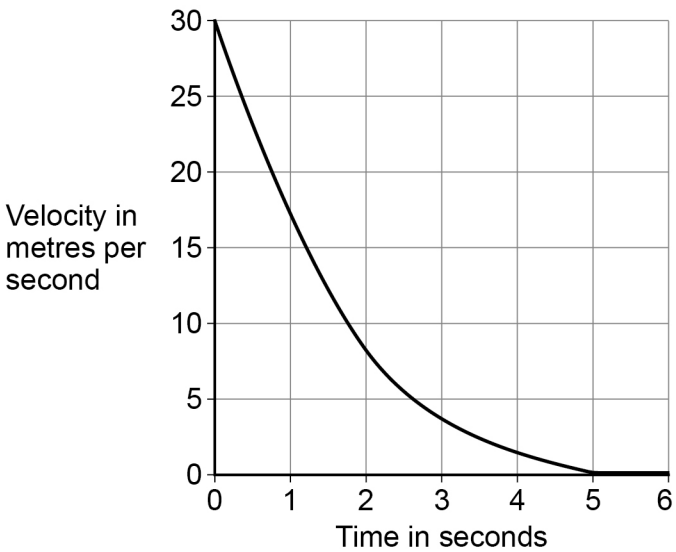
Reaction time = _____ s

Question 6 continues on the next page

6.5.4.3.1 Stopping distance

0 6 . 2 **Figure 10** shows how the velocity of a car changes during braking.

Figure 10



Determine the braking distance of the car.

[3 marks]

Braking distance = _____ m

6.5.4.3.1 Stopping distance

Question 03 · continued

0 6 . 3 Explain how the gradient of the line on **Figure 10** shows that the resultant force on the car was **not** constant.

[3 marks]

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Turn over for the next question

6.5.4.3.1 Stopping distance

Question 04

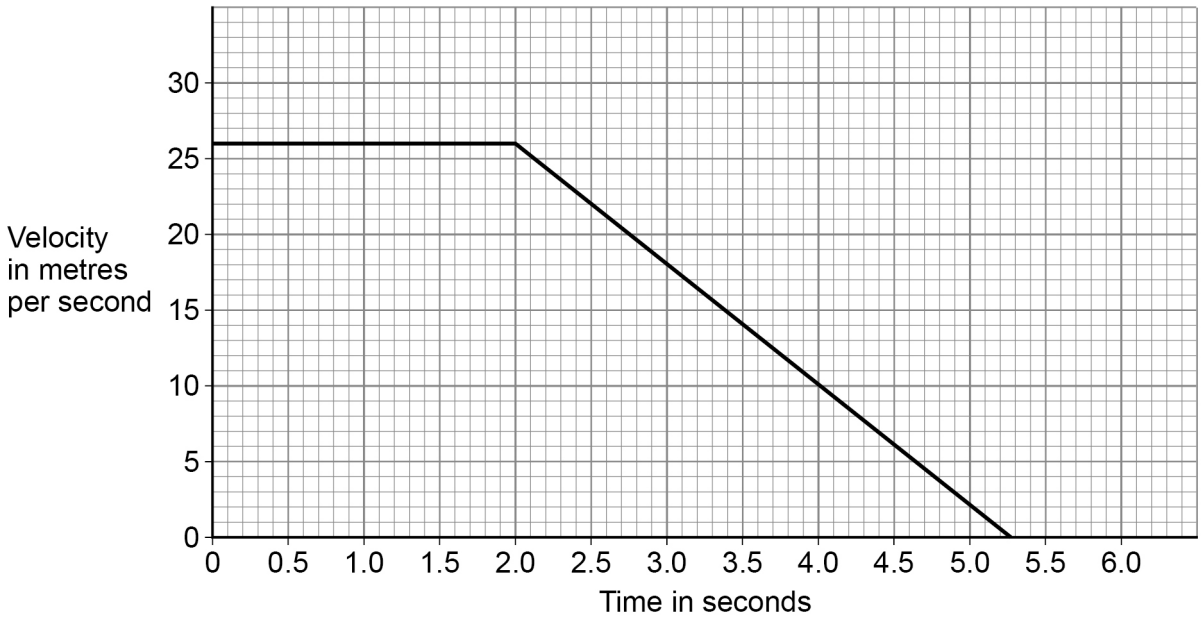
June 2023 | 8464/P/2H | Original Q7

0 7 A car contains a device called a black box. The black box records the velocity and acceleration of the car.

The car was travelling at a constant velocity. The driver then reacted to a hazard.

Figure 11 shows the velocity–time graph for the car.

Figure 11



0 7 . 1 Determine the deceleration of the car.

Give the unit.

[3 marks]

Deceleration = _____ Unit _____

6.5.4.3.1 Stopping distance

Question 04 · continued

0 7 . 2 The driver of the car has a reaction time of 0.75 s.

Determine the stopping distance of the car.

Use the Physics Equations Sheet.

Use **Figure 11**.

[5 marks]

Stopping distance = _____ m

0 7 . 3 If the black box records large decelerations, it identifies that the driving may be dangerous.

Explain why large decelerations may be dangerous.

[2 marks]

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6.5.4.3.1 Stopping distance

Question 05

June 2024 | 8464/P/2H | Original Q5

0 5 A safety test was carried out to determine how the speed of a car affects the stopping distance of the car.

0 5 . 1 At the start of the test the car was moving slowly.

Then the car accelerated at 5.8 m/s^2 for 2.5 s.

The final velocity of the car was 20 m/s.

Calculate the initial velocity of the car.

Use the Physics Equations Sheet.

[4 marks]

Initial velocity = _____ m/s

0 5 . 2 The reaction time of the driver was measured.

How can the reaction time of the driver be used to calculate the thinking distance?

[1 mark]

Question 5 continues on the next page

6.5.4.3.1 Stopping distance

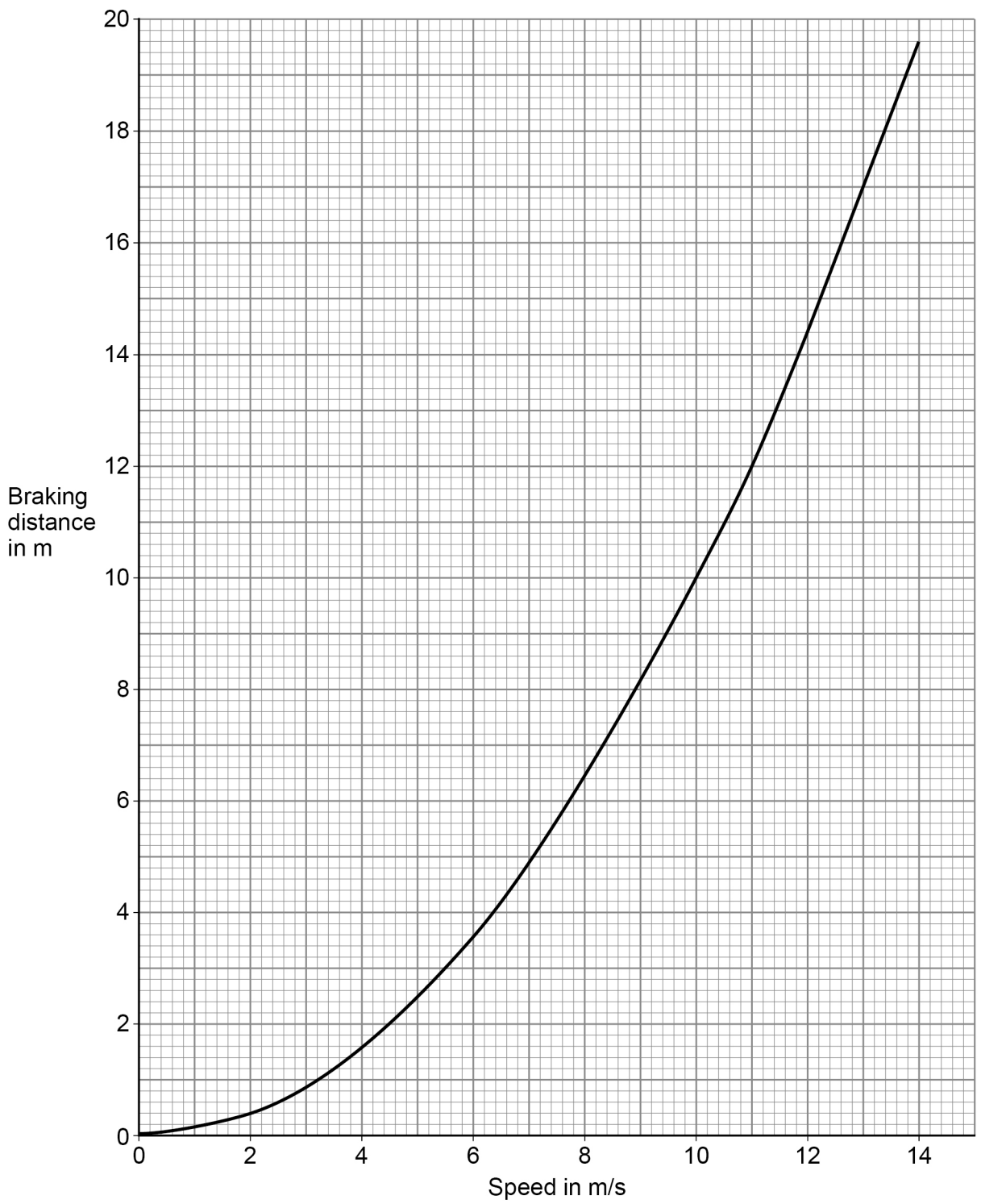
Question 05 · continued

The car was driven at a constant speed. The driver applied the maximum braking force, and the braking distance was measured.

The test was repeated at different speeds.

Figure 8 shows the results.

Figure 8



6.5.4.3.1 Stopping distance

Question 05 · continued

0 5 . 3 Which of the following gives the relationship between the speed and the braking distance?

[1 mark]

Tick (✓) **one** box.

braking distance $\propto \frac{1}{\text{speed}}$ ☐

braking distance $\propto$ speed ☐

braking distance $\propto$ speed^2 ☐

0 5 . 4 During one test the brakes were applied with a force of 6250 N.

The deceleration of the car was 5.0 m/s^2.

The braking distance of the car was 14.4 m.

Determine the momentum of the car before the brakes were applied.

Use the Physics Equations Sheet.

Use **Figure 8**.

[6 marks]

Momentum = _____ kg m/s

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6.5.4.3.1 Stopping distance

Question 06

0 2 The stopping distance of a car is affected by the condition of the brakes and tyres.

A car is being driven around a corner when the driver sees some roadworks.

0 2 . 1 The driver applies the brakes when the car is 24 m away from the roadworks.

The velocity of the car changes from 18 m/s to 0 m/s.

Calculate the constant deceleration needed to stop the car in a distance of 24 m.

Use the Physics Equations Sheet.

[3 marks]

Deceleration = _____ m/s^2

6.5.4.3.1 Stopping distance

Question 06 · continued

0 2 . 2 As a safety measure, the speed limit on the road was reduced.

Explain how the safety of road users is affected by:

- the condition of the brakes and tyres
- reduced speed.

You should refer to thinking distance and braking distance.

[6 marks]

Extra space

Question 2 continues on the next page

6.5.4.3.1 Stopping distance

0 2 . 3 Two identical cars were driven along a straight, level road.

One car had a greater speed than the other car.

The driver of each car applied the brakes until the cars stopped.

Both cars travelled the same distance while braking.

Explain how braking from a greater speed affected the risk of the brakes overheating.

[3 marks]

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