AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.5.5.1

Momentum is a property of moving objects

Past-paper questions

Tier	**Higher**
Question groups	**5**
Available paper years	**2018–2024**

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.

6.5.5.1 Momentum is a property of moving objects

Question 01

June 2018 | 8464/P/2H | Original Q3

0 3 **Figure 5** shows an ice skater, Skater **A**.

Figure 5



0 3 . 1 Write down the equation that links mass, momentum and velocity.

[1 mark]

_____

0 3 . 2 Skater **A** travels with a velocity of 3.2 m/s and has a momentum of 200 kg m/s

Calculate the mass of Skater **A**.

[3 marks]

_____

_____

Mass = _____ kg

6.5.5.1 Momentum is a property of moving objects

Question 01 · continued

0 3 . 3 Skater **A** bumps into another skater, Skater **B**. Skater **B** is stationary.

The skaters move off together in a straight line.

Explain what happens to the velocity of each of the skaters.

Use the idea of conservation of momentum.

[3 marks]

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Turn over for the next question

6.5.5.1 Momentum is a property of moving objects

Question 02

June 2019 | 8464/P/2H | Original Q3

0 3 Some quantities are scalars and some are vectors.

0 3 . 1 Which of the following quantities are scalars?

[2 marks]

Tick (✓) **two** boxes.

- Displacement ☐
- Distance ☐
- Force ☐
- Speed ☐
- Velocity ☐

0 3 . 2 Give the difference between a vector quantity and a scalar quantity.

[1 mark]

Question 3 continues on the next page

6.5.5.1 Momentum is a property of moving objects

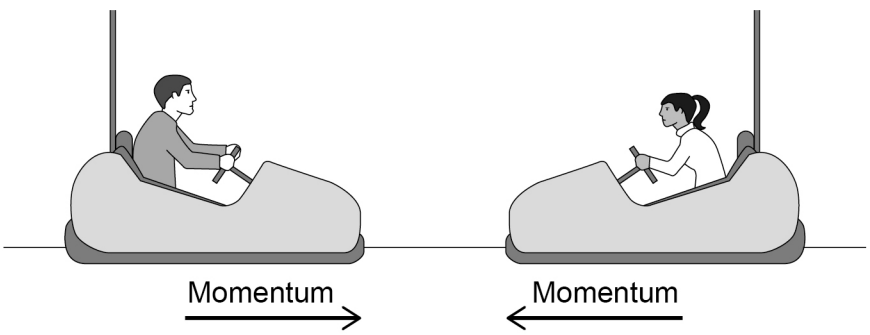
Question 02 · continued

Bumper cars are a fairground ride and are designed to bump into each other.

Figure 5 shows two bumper cars moving towards each other.

The momentum of each bumper car is shown by an arrow.

Figure 5



0 3 . 3 Give **two** factors that affect the momentum of each bumper car.

[2 marks]

1 _____

2 _____

0 3 . 4 The bumper cars crash into each other and stop.

Explain why both bumper cars stop after the crash.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

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6.5.5.1 Momentum is a property of moving objects

Question 03

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

0 4 **Figure 8** shows a girl bowling a ball along a ten-pin bowling lane.

Figure 8



The girl is trying to knock down the ten pins at the end of the bowling lane.

0 4 . 1 Velocity is a vector quantity, speed is a scalar quantity.

Describe what is meant by a vector quantity and a scalar quantity.

[2 marks]

Vector quantity _____

_____

Scalar quantity _____

_____

0 4 . 2 The bowling lane is horizontal.

Explain why the bowling ball decelerates as it travels along the lane.

[2 marks]

_____

_____

_____

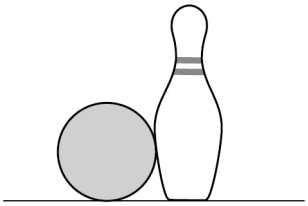
_____

6.5.5.1 Momentum is a property of moving objects

Question 03 · continued

Figure 9 shows the bowling ball hitting one of the pins.

Figure 9



0 4 . 3 Write down the equation that links mass (*m*), momentum (*p*) and velocity (*v*).

[1 mark]

0 4 . 4 The bowling ball has a velocity of 5.0 m/s when it hits the pin.

The momentum of the bowling ball is 26 kg m/s

Calculate the mass of the bowling ball.

[3 marks]

Mass = _____ kg

Question 4 continues on the next page

6.5.5.1 Momentum is a property of moving objects

Question 03 · continued

0 4 . 5 Explain why the bowling ball slows down when it hits the pin.

You should use ideas about momentum in your answer.

[3 marks]

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6.5.5.1 Momentum is a property of moving objects

Question 04

0 3 **Figure 4** shows a child playing with a toy train.

The train is on a bridge.

Figure 4



When the child lets go of the train, the train rolls down the bridge.

0 3 . 1 The momentum of the train at the bottom of the bridge is 0.216 kg m/s

mass of the train = 180 g

Calculate the velocity of the train at the bottom of the bridge.

Use the Physics Equations Sheet.

[4 marks]

Velocity = _____ m/s

6.5.5.1 Momentum is a property of moving objects

Question 04 · continued

0 3 . 2 The train collides with a stationary carriage on the track.

Explain why the velocity of the train after the collision is less than it was before the collision.

Use ideas about momentum in your answer.

[4 marks]

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6.5.5.1 Momentum is a property of moving objects

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

6.5.5.1 Momentum is a property of moving objects

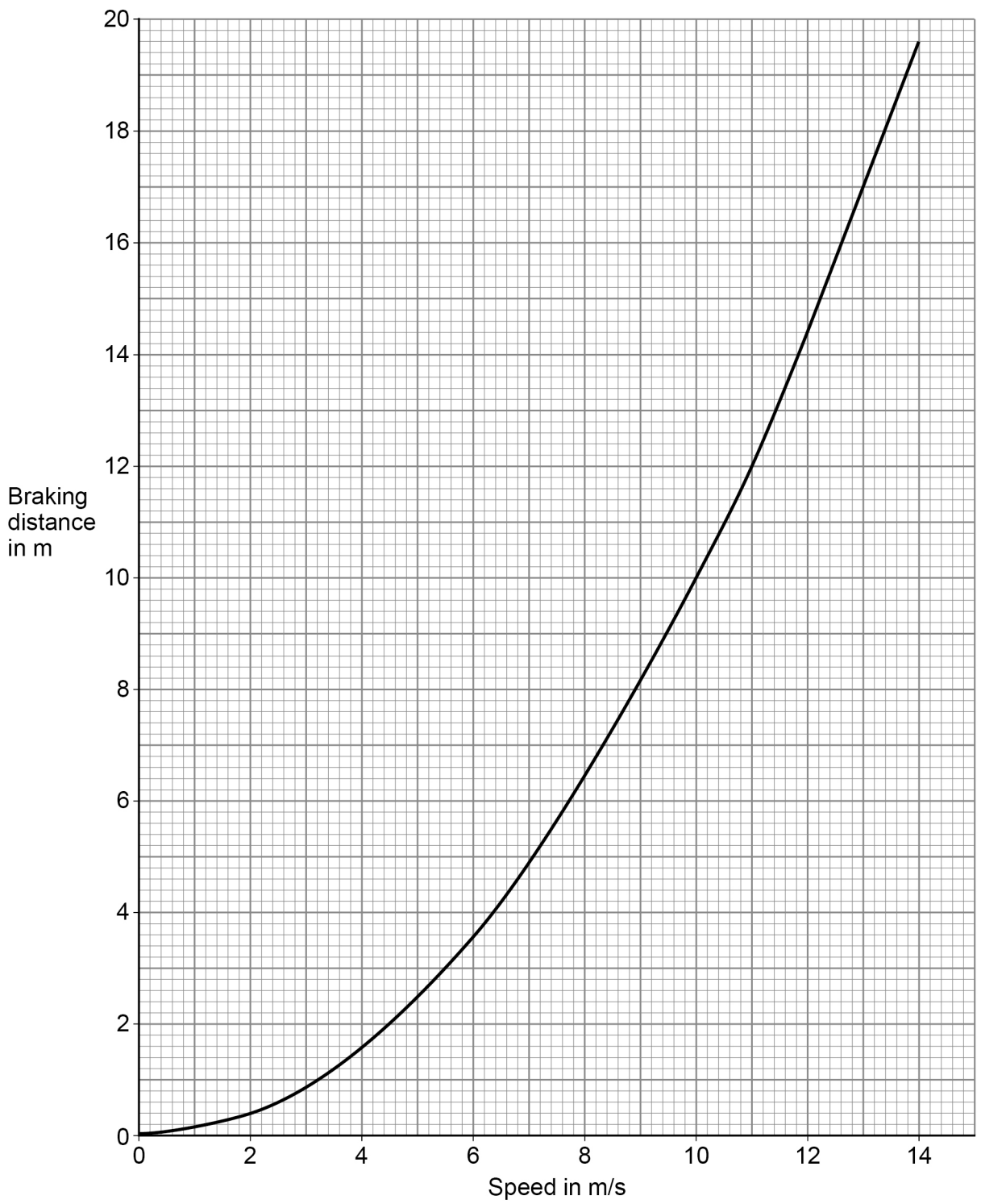
Question 05 · continued

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



6.5.5.1 Momentum is a property of moving objects

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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