AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.5.4.1.5

Acceleration

Past-paper questions

Tier	**Foundation**
Question groups	**17**
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.

6.5.4.1.5 Acceleration

Question 01

June 2018 | 8464/P/2F | Original Q1

0 1 . 1 Which of these is a scalar quantity?

[1 mark]

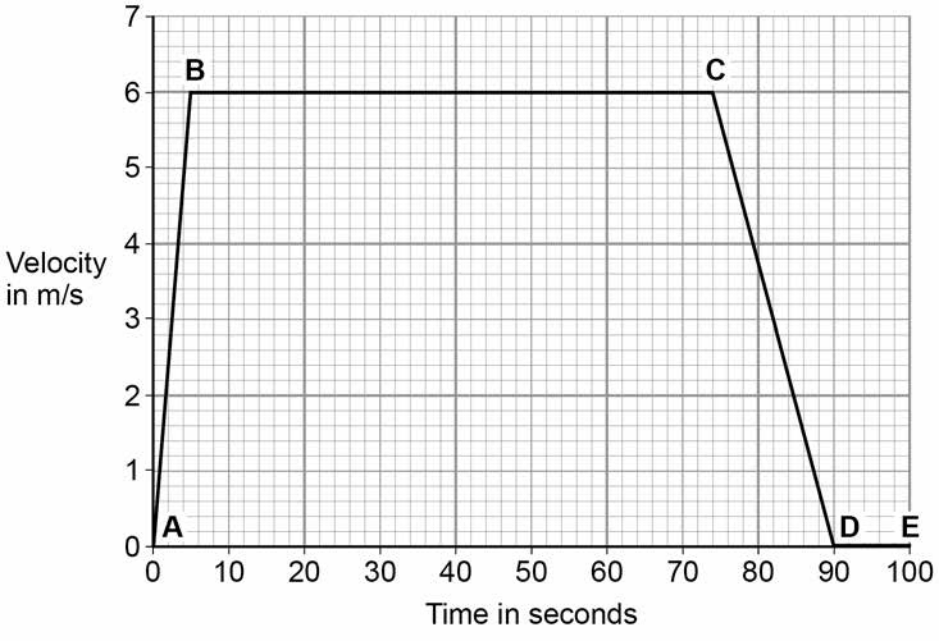
Tick **one** box.

- displacement ☐
- distance ☐
- force ☐
- velocity ☐

0 1 . 2 A woman cycled along a straight flat road.

Figure 1 shows how the woman's velocity changed with time.

Figure 1



Which part of the graph shows the woman moving at constant velocity?

[1 mark]

Tick **one** box.

BC ☐ **CD** ☐ **DE** ☐

6.5.4.1.5 Acceleration

Question 01 · continued

0 1 . 3 Which part of the graph shows the woman stationary?

[1 mark]

Tick **one** box.

BC ☐ **CD** ☐ **DE** ☐

Between points **A** and **B** the woman was accelerating.

0 1 . 4 Use **Figure 1** to determine the total time for which she was accelerating.

[1 mark]

Time = _____ s

0 1 . 5 Use **Figure 1** to determine her increase in velocity between points **A** and **B**.

[1 mark]

Increase in velocity = _____ m/s

0 1 . 6 Calculate her acceleration between points **A** and **B**.

Use the equation:

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

[2 marks]

Acceleration = _____ m/s^2

Question 1 continues on the next page

6.5.4.1.5 Acceleration

Question 01 · continued

0 1 . 7 Estimate how a typical cycling speed of 6 m/s compares with a typical walking speed.

[1 mark]

Tick **one** box.

about twice as fast ☐

about four times faster ☐

about eight times faster ☐

8

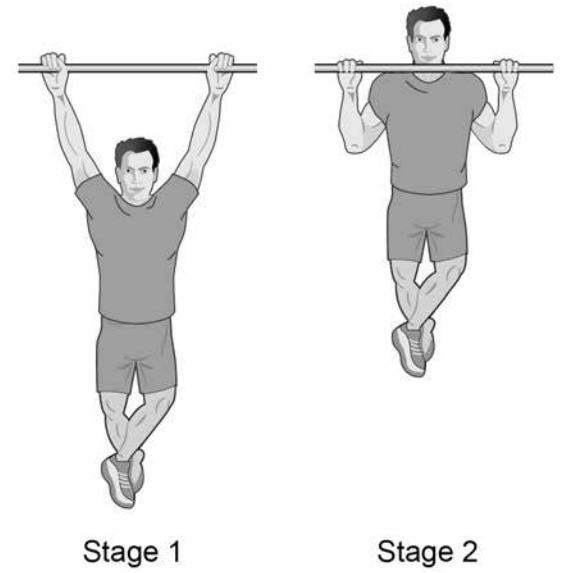
6.5.4.1.5 Acceleration

Question 02

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

0 3 **Figure 4** shows a man doing two stages of a pull up. In both diagrams the man is stationary.

Figure 4



0 3 . 1 Complete the sentence.

Choose the answer from the box.

[1 mark]

equal to	**less than**	**more than**

In stage 1 the downwards force of the man on the bar is _____ the upwards force of the bar on the man.

0 3 . 2 The man has a mass of 85 kg

Gravitational field strength = 9.8 N/kg

Calculate the weight of the man.

Use the equation:

weight = mass × gravitational field strength

[2 marks]

_____

_____

Weight = _____ N

6.5.4.1.5 Acceleration

Question 02 · continued

0 3 . 3 The man raises his body a vertical distance of 0.63 m to go from stage 1 to stage 2

Calculate the work done by the man.

Use your answer to question **03.2**

Use the equation:

work done = force × distance

[2 marks]

Work done = _____ J

0 3 . 4 The man was **not** moving at stage 2

How much work is done by the man at stage 2?

[1 mark]

Work done = _____ J

0 3 . 5 A woman uses the bar to do a pull up.

The woman has a mass of 62 kg

She accelerates at 11 m/s^2

Calculate the resultant force on the woman.

Use the equation:

force = mass × acceleration

[2 marks]

Force = _____ N

8

6.5.4.1.5 Acceleration

Question 03

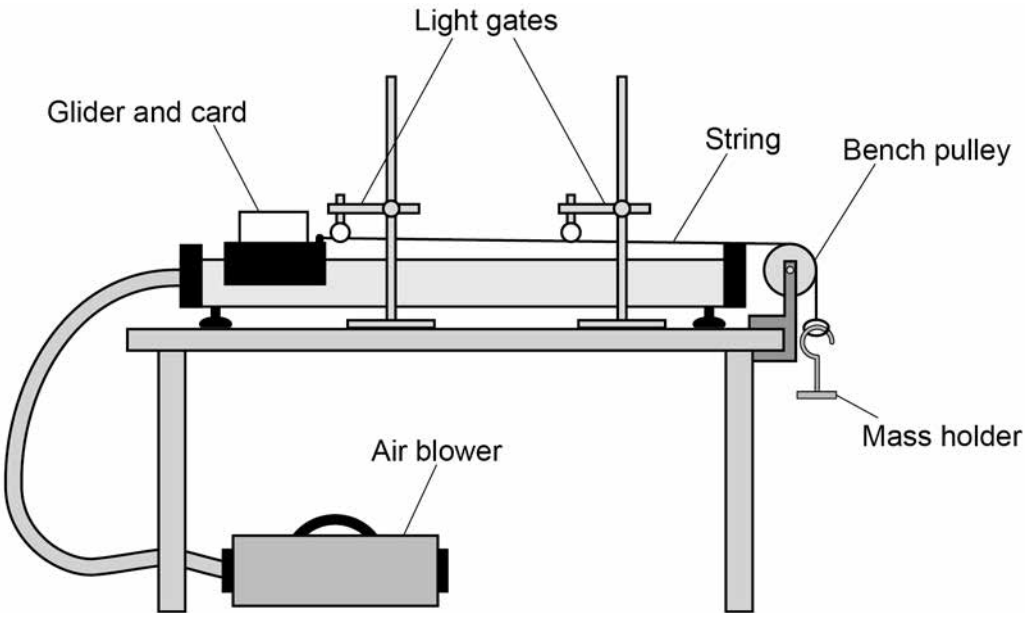
June 2018 | 8464/P/2F | Original Q7

0 7 A student investigated acceleration using gliders, an air track and light gates.

The air track reduces friction between the glider and the track to zero.

Figure 11 shows the apparatus.

Figure 11



The glider was released from rest and moved along the track.

The mass holder hit the ground before the card passed through the second light gate.

0 7 . 1 Which **two** statements describe the effect this would have on the glider?

[2 marks]

Tick **two** boxes.

Its acceleration would decrease to zero. ☐

Its acceleration would increase. ☐

The resultant force on it would decrease to zero. ☐

The resultant force on it would increase. ☐

Its speed would increase. ☐

6.5.4.1.5 Acceleration

Question 03 · continued

0 7 . 2 The mass holder should **not** hit the ground before the card passes through the second light gate.

Suggest **one** way that the student could stop this happening.

[1 mark]

Question 7 continues on the next page

6.5.4.1.5 Acceleration

Question 03 · continued

The student increased the resultant force acting on the glider by adding more masses to the mass holder.

She calculated the acceleration of the glider for each resultant force.

Each test was done three times.

Table 2 shows the results.

Table 2

Resultant force in N	Acceleration in m/s^2			Mean acceleration in m/s^2
	Test 1	Test 2	Test 3	
0.20	1.3	1.2	1.3	1.26667
0.39	2.6	2.5	2.6	2.6
0.59	3.8	3.8	3.9	3.8
0.78	5.1	5.1	5.1	5.1
0.98	6.4	7.2	6.4	6.7

0 7 . 3 The student made **two** mistakes in the mean acceleration column.

Identify the mistakes the student made.

Suggest how each mistake can be corrected.

[4 marks]

Mistake _____

_____

Correction _____

_____

Mistake _____

_____

Correction _____

_____

6.5.4.1.5 Acceleration

Question 03 · continued

0 7 . 4 Write a conclusion for this investigation.

Use the data in **Table 2**

[1 mark]

Question 7 continues on the next page

6.5.4.1.5 Acceleration

Question 03 · continued

0 7 . 5 The student used a constant resultant force to accelerate the glider.

The student changed the mass of the glider and calculated the new acceleration.

She repeated this for different masses of the glider, keeping the resultant force constant.

The results are shown in **Table 3**

Table 3

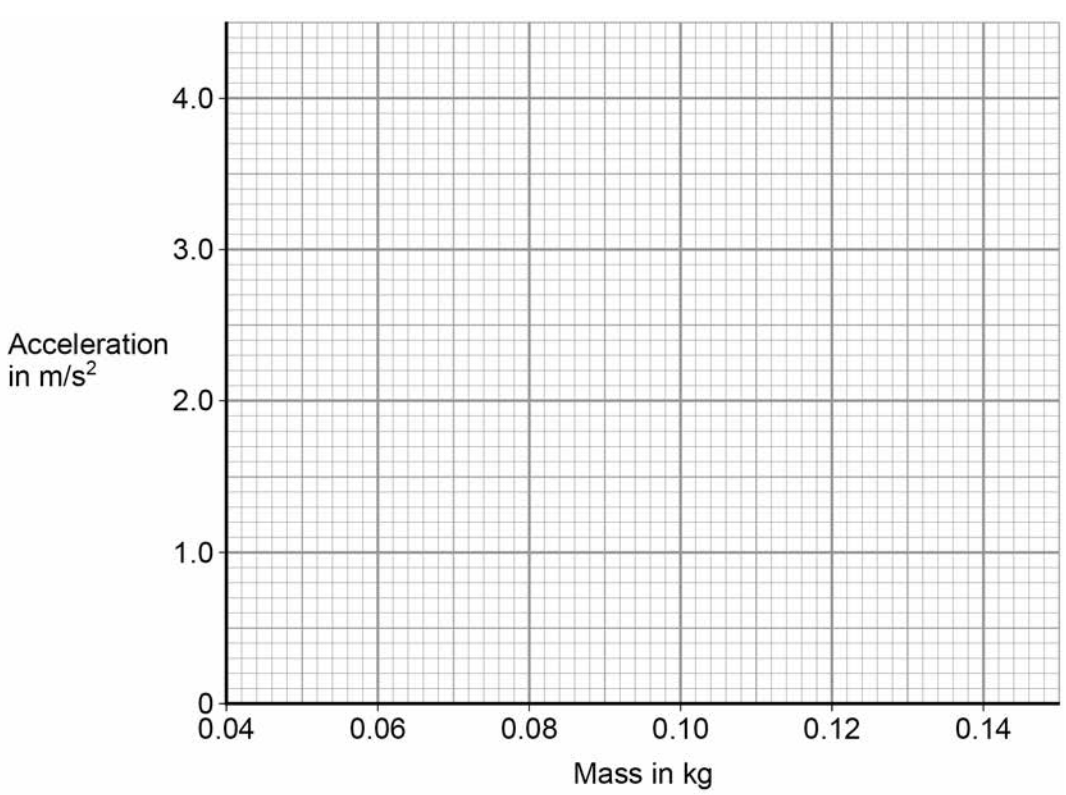
Mass of the glider in kg	Acceleration in m/s^2
0.060	3.5
0.080	2.6
0.10	2.0
0.12	1.7
0.14	1.4

Plot the results on **Figure 12**

Draw a line of best fit.

[3 marks]

Figure 12



6.5.4.1.5 Acceleration

Question 03 · continued

0 7 . 6 Describe the relationship between mass and acceleration.

[1 mark]

12

Turn over for the next question

6.5.4.1.5 Acceleration

Question 04

June 2019 | 8464/P/2F | Original Q6

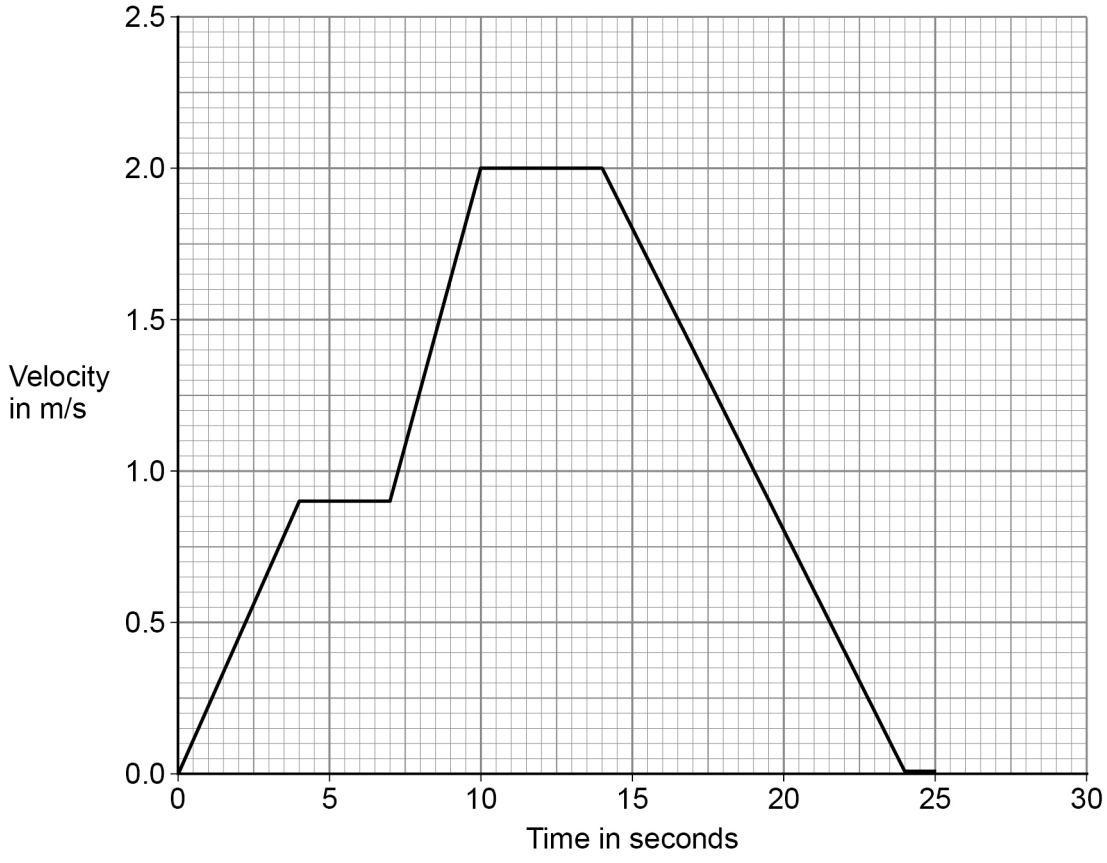
0 6 **Figure 9** shows a runner using a smart watch and a mobile phone to monitor her run.

Figure 9



Figure 10 is a velocity–time graph for part of the runner's warm-up.

Figure 10



6.5.4.1.5 Acceleration

Question 04 · continued

0 6 . 1 Determine the total time for which the velocity of the runner was increasing.

[2 marks]

Time = _____ s

0 6 . 2 Determine the deceleration of the runner.

[2 marks]

Deceleration = _____ m/s^2

Question 6 continues on the next page

6.5.4.1.5 Acceleration

Question 04 · continued

The smart watch and mobile phone are connected to each other by a system called Bluetooth.

Bluetooth is wireless and uses electromagnetic waves for communication.

0 6 . 3 Suggest why the phone and watch being connected by a wireless system is an advantage when running.

[1 mark]

0 6 . 4 Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

0 6 . 5 The electromagnetic waves have a frequency of 2 400 000 000 Hz

The speed of electromagnetic waves is 300 000 000 m/s

Calculate the wavelength of the electromagnetic waves.

[3 marks]

Wavelength = _____ m

6.5.4.1.5 Acceleration

Question 04 · continued

0 6 . 6 **Table 3** shows some information about four types of Bluetooth.

Table 3

Type	Power in milliwatts	Range in metres
1	100	100
2	2.50	10.0
3	1.00	1.00
4	0.50	0.50

Mobile phones use type **2** Bluetooth to communicate with other devices.

Suggest **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____

11

6.5.4.1.5 Acceleration

Question 05

November 2020 | 8464/P/2F | Original Q1

0 1 **Figure 1** shows a girl bowling a ball along a ten-pin bowling lane.

Figure 1



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

As the ball travels along the lane the velocity of the ball decreases.

0 1 . 1 Velocity is a vector.

Which statement describes a vector?

[1 mark]

Tick (✓) **one** box.

Vectors have direction only. ☐

Vectors have magnitude and direction. ☐

Vectors have magnitude only. ☐

6.5.4.1.5 Acceleration

Question 05 · continued

0 1 . 2 Why does the velocity of the ball decrease as the ball travels along the lane?

[1 mark]

Tick (✓) **one** box.

The force of gravity slows the ball down. ☐

There are no forces acting on the ball. ☐

There is a resultant force acting on the ball. ☐

0 1 . 3 The ball travels along the lane at an average speed of 4.5 m/s

It takes the ball 4.0 seconds to travel the length of the lane.

Calculate the length of the lane.

Use the equation:

distance travelled = speed × time

[2 marks]

Length of the lane = _____ m

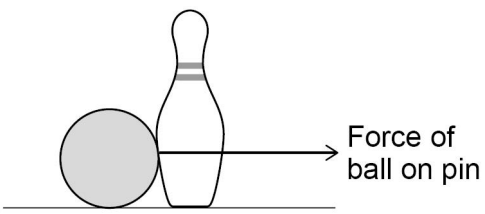
Question 1 continues on the next page

6.5.4.1.5 Acceleration

Question 05 · continued

Figure 2 shows the ball hitting one of the pins.

Figure 2



0 1 . 4 Draw an arrow on **Figure 2** to show the force of the pin on the ball.

[2 marks]

0 1 . 5 The velocity of the pin changes from 0 to 12 m/s

It takes 0.15 seconds for the velocity to change.

Calculate the acceleration of the pin.

Use the equation:

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

[2 marks]

Acceleration = _____ m/s^2

6.5.4.1.5 Acceleration

Question 05 · continued

0 1 . 6 When the pin is struck it accelerates.

Complete the sentences.

Choose answers from the box.

Each answer can be used once, more than once, or not at all.

[3 marks]

decreases	**increases**	**stays the same**

The displacement of the pin from the girl _____ .

The mass of the pin _____ .

The kinetic energy of the pin _____ .

11

Turn over for the next question

6.5.4.1.5 Acceleration

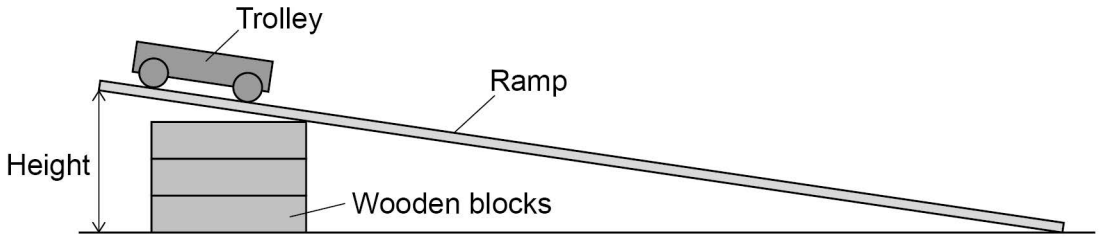
Question 06

November 2020 | 8464/P/2F | Original Q7

0 7 A student investigated how the height of a ramp affects the acceleration of a trolley down the ramp.

Figure 11 shows some of the equipment used.

Figure 11



0 7 . 1 Plan an investigation to determine how the height of the ramp affects the acceleration of the trolley.

[6 marks]

6.5.4.1.5 Acceleration

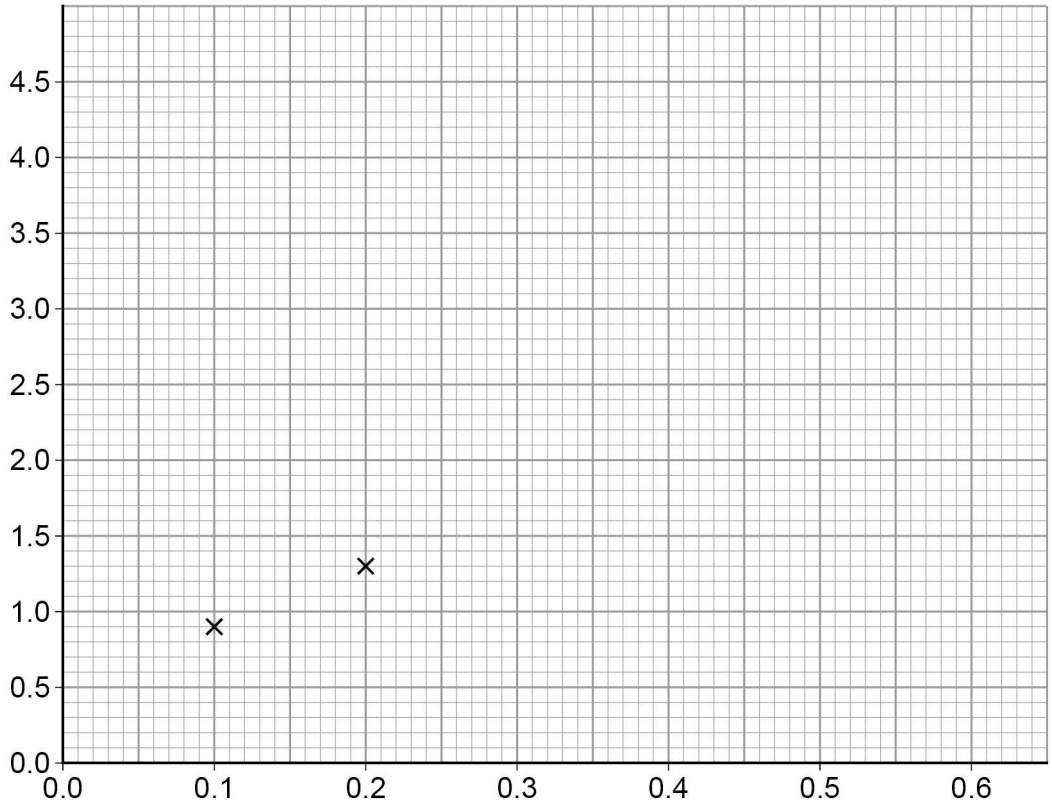
Table 2 shows the results.

Table 2

Height of ramp in metres	0.1	0.2	0.3	0.4	0.5	0.6
Acceleration in m/s^2	0.9	1.3	2.1	3.2	3.9	4.3

The first two results have been plotted on **Figure 12**.

Figure 12



0 7 . 2 Complete **Figure 12**.

You should:

- label the axes
- plot the remaining results from **Table 2**
- draw a line of best fit.

[4 marks]

Question 7 continues on the next page

6.5.4.1.5 Acceleration

Question 06 · continued

0 7 . 3 Write down the equation that links acceleration (a), mass (m) and resultant force (F).

[1 mark]

0 7 . 4 When the resultant force on the trolley was 0.63 N the acceleration of the trolley was 2.1 m/s^2

Calculate the mass of the trolley.

[3 marks]

Mass of trolley = _____ kg

14

6.5.4.1.5 Acceleration

Question 07

November 2021 | 8464/P/2F | Original Q5

0 5 Scientists are developing a rocket aeroplane designed to travel much faster than jet aeroplanes.

0 5 . 1 The rocket aeroplane must accelerate along a runway to take off.

What would happen to the air resistance acting on the rocket aeroplane as it accelerates?

[1 mark]

0 5 . 2 An upward force called lift will act on the wings of the rocket aeroplane when it moves.

Complete the sentence.

Choose the answer from the box.

[1 mark]

less than	**the same as**	**greater than**

As the rocket aeroplane starts to accelerate along the runway, the lift force on the wings will be _____ the weight of the rocket aeroplane.

Question 5 continues on the next page

6.5.4.1.5 Acceleration

Question 07 · continued

0 5 . 3 During the first 14 seconds the average speed of the rocket aeroplane on the runway will be 35 m/s.

Calculate the distance that the rocket aeroplane will travel during the first 14 seconds.

Use the equation:

distance travelled = average speed × time

[2 marks]

Distance travelled = _____ m

0 5 . 4 Write down the equation which links distance (*s*), force (*F*) and work done (*W*).

[1 mark]

0 5 . 5 When the rocket aeroplane travels a distance of 270 m on the runway the engines will do 54 000 000 J of work.

Calculate the average force exerted by the engines.

[3 marks]

Average force = _____ N

6.5.4.1.5 Acceleration

Question 07 · continued

0 5 . 6 The rocket aeroplane will fly at a greater height than a jet aeroplane.

The height that an aeroplane flies at affects the radiation dose a passenger will receive each hour.

Table 2 shows the speed of each aeroplane and the radiation dose a passenger will receive each hour.

Table 2

Aeroplane	Speed in metres per second	Radiation dose each hour in millisieverts
Rocket aeroplane	8000	0.006
Jet aeroplane	250	0.003

Exposure to ionising radiation has risks and possible consequences.

Evaluate the risks and possible consequences of flying in a rocket aeroplane and in a jet aeroplane.

Assume the same journey is made in each aeroplane.

Use values from **Table 2**.

[6 marks]

14

6.5.4.1.5 Acceleration

Question 08

November 2021 | 8464/P/2F | Original Q7

0 7 Professional rugby players wear a tracking device that measures their velocity and acceleration.

Figure 9 shows a player wearing a tracking device.

The player is tackling another player who is running with the ball.

Figure 9



0 7 . 1 Velocity and acceleration are both vector quantities.

What is a vector quantity?

[1 mark]

Tick (✓) **one** box.

- A quantity with both magnitude and direction ☐
- A quantity with direction only ☐
- A quantity with magnitude only ☐

6.5.4.1.5 Acceleration

Question 08 · continued

0 7 . 2 Which of the following is a vector quantity?

[1 mark]

Tick (✓) **one** box.

- Displacement ☐
- Distance ☐
- Time ☐
- Work done ☐

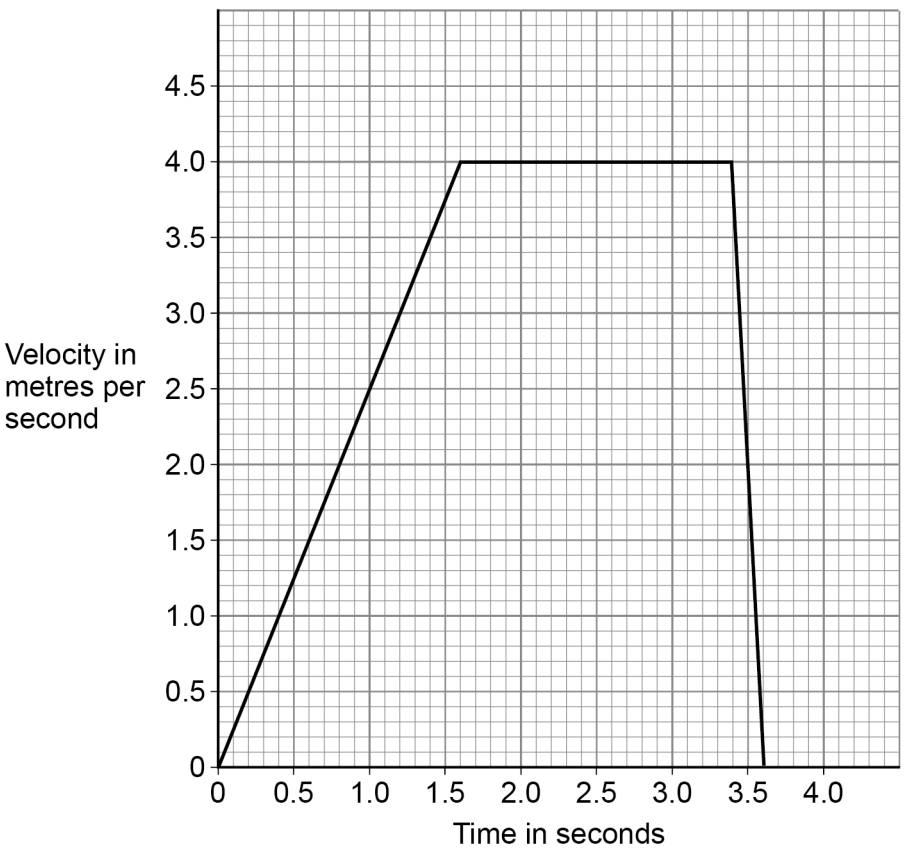
Question 7 continues on the next page

6.5.4.1.5 Acceleration

Question 08 · continued

Figure 10 shows a velocity–time graph for the player running with the ball.

Figure 10



0 7 . 3 Determine the acceleration of the player between 0 and 1.6 s.

[2 marks]

Acceleration = _____ m/s^2

0 7 . 4 Describe the motion of the player between 3.4 s and 3.6 s.

[1 mark]

6.5.4.1.5 Acceleration

Question 08 · continued

The force exerted on the player when she is tackled causes her to accelerate.

0 7 . 5 Write down the equation which links acceleration (*a*), mass (*m*) and resultant force (*F*).

[1 mark]

0 7 . 6 The player accelerates at 25 m/s^2 when a resultant force of 1800 N acts on her.

Calculate the mass of the player.

[3 marks]

Mass = _____ kg

0 7 . 7 The tracking device sends data to a computer during the game.

Suggest **one** advantage of the data being sent during the game.

[1 mark]

10

6.5.4.1.5 Acceleration

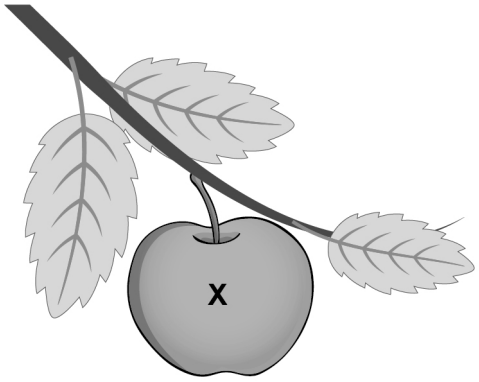
Question 09

June 2022 | 8464/P/2F | Original Q3

0 3 **Figure 4** shows an apple hanging from a tree.

The **X** marks the centre of mass of the apple.

Figure 4



0 3 . 1 Draw an arrow on **Figure 4** to represent the weight of the apple.

[1 mark]

0 3 . 2 The apple has a mass of 0.150 kg

gravitational field strength = 9.8 N/kg

Calculate the weight of the apple.

Use the equation:

weight = mass × gravitational field strength

[2 marks]

Weight = _____ N

6.5.4.1.5 Acceleration

Question 09 · continued

0 3 . 3 The apple in **Figure 4** is stationary.

Why is the apple stationary?

[1 mark]

Tick (✓) **one** box.

The resultant force on the apple is downwards. ☐

The resultant force on the apple is upwards. ☐

The resultant force on the apple is zero. ☐

Question 3 continues on the next page

6.5.4.1.5 Acceleration

Question 09 · continued

When the apple is ripe it falls from the tree and accelerates towards the ground.

0 3 . 4 Why does the apple accelerate?

[1 mark]

Tick (✓) **one** box.

The resultant force on the apple is downwards. ☐

The resultant force on the apple is upwards. ☐

The resultant force on the apple is zero. ☐

0 3 . 5 The acceleration of the apple is 9.8 m/s^2

The velocity of the apple changes from 0 to 4.9 m/s

Calculate the time taken for the apple to fall to the ground.

Use the equation:

$$\text{time taken} = \frac{\text{change in velocity}}{\text{acceleration}}$$

[2 marks]

Time taken = _____ s

7

6.5.4.1.5 Acceleration

Question 10

June 2022 | 8464/P/2F | Original Q5

0 5 The stopping distance of a car is the sum of the thinking distance and the braking distance.

0 5 . 1 Which factors affect the thinking distance?

[2 marks]

Tick (✓) **two** boxes.

- Condition of the tyres ☐
- Driving on wet roads ☐
- Mass of the car ☐
- Tiredness of the driver ☐
- Using a mobile phone ☐

0 5 . 2 Explain why a person should **not** drink alcohol and then drive.

[3 marks]

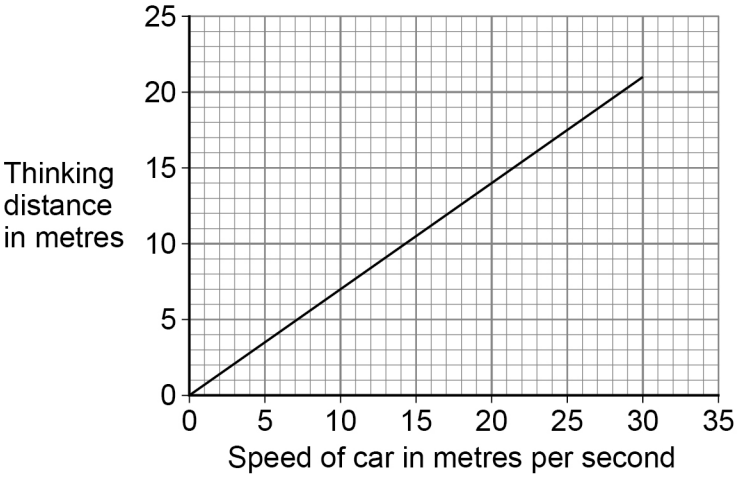
6.5.4.1.5 Acceleration

Question 10 · continued

The Highway Code gives information on how thinking distance depends on the speed of a car.

Figure 7 shows the information as a graph.

Figure 7



0 5 . 3 What is the speed of a car if the thinking distance is 16 m?

[1 mark]

Speed of car = _____ m/s

0 5 . 4 Describe the relationship between speed and thinking distance.

[2 marks]

_____

_____

_____

_____

0 5 . 5 The Highway Code assumes the driver's reaction time is 0.70 seconds.

Draw a line on **Figure 7** to show the relationship for a driver with a reaction time of 1.4 seconds.

[2 marks]

6.5.4.1.5 Acceleration

Question 10 · continued

0 5 . 6 A car accelerates at 5.0 m/s^2 over a distance of 45 m

initial velocity of the car = 0 m/s

Calculate the final velocity of the car.

Use the Physics Equations Sheet.

Give your answer to 2 significant figures.

[4 marks]

Final velocity (2 significant figures) = _____ m/s

14

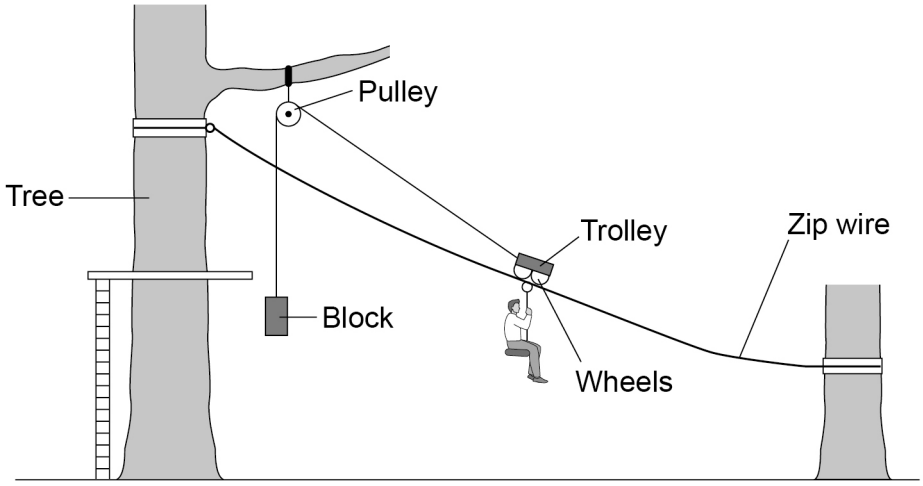
6.5.4.1.5 Acceleration

Question 11

June 2023 | 8464/P/1F | Original Q2

0 2 **Figure 3** shows a person using a zip wire to move from a tree to the ground.

Figure 3



As the person moves down the zip wire, the block moves upwards.

0 2 . 1 What happens to the gravitational potential energy of the person as the person accelerates down the zip wire?

[1 mark]

Tick (✓) **one** box.

Decreases ☐

Stays the same ☐

Increases ☐

6.5.4.1.5 Acceleration

Question 11 · continued

0 2 . 2 What happens to the kinetic energy of the person as the person accelerates down the zip wire?

[1 mark]

Tick (✓) **one** box.

Decreases ☐

Stays the same ☐

Increases ☐

0 2 . 3 The block is 3.4 m above the ground when the person is at the bottom of the zip wire.

mass of block = 2.5 kg

gravitational field strength = 9.8 N/kg

Calculate the gravitational potential energy of the block.

Use the equation:

gravitational potential energy = mass × gravitational field strength × height

[2 marks]

Gravitational potential energy = _____ J

Question 2 continues on the next page

6.5.4.1.5 Acceleration

Question 11 · continued

The trolley is a seat suspended from wheels which can roll along the zip wire.

0 2 . 4 When the person reaches the end of the zip wire, the person gets off the trolley.

The block falls downwards pulling the trolley back to the top of the zip wire.

maximum speed of block = 4.8 m/s

mass of block = 2.5 kg

Calculate the maximum kinetic energy of the block.

Use the equation:

$$\text{kinetic energy} = 0.5 \times \text{mass} \times (\text{speed})^2$$

[2 marks]

Maximum kinetic energy = _____ J

0 2 . 5 As the trolley moves, work is done against friction.

What is the effect of this?

[1 mark]

Tick (✓) **one** box.

- Some energy is destroyed. ☐
- Some energy is transferred to the surroundings. ☐
- The total energy of the block and trolley increases. ☐

6.5.4.1.5 Acceleration

Question 11 · continued

0 2 . 6 The person oils the wheels on the trolley.

Explain how this will affect the speed of the person down the zip wire.

[2 marks]

9

Turn over for the next question

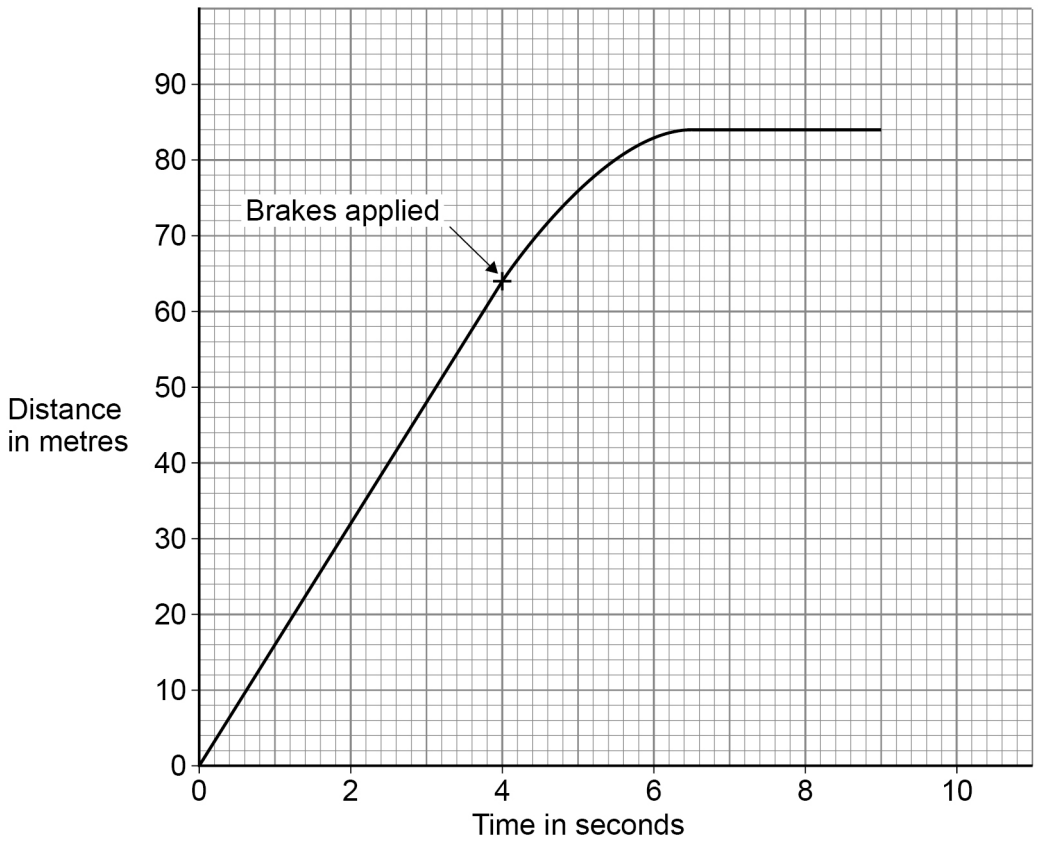
6.5.4.1.5 Acceleration

Question 12

0 2 A car contains a device called a black box. The black box records the distance travelled and the time taken for each journey.

Figure 3 shows the distance–time graph for part of a journey.

Figure 3



0 2 . 1 Which feature of **Figure 3** shows that the car travels at a constant speed for the first 4 seconds?

[1 mark]

Tick (✓) **one** box.

The line becomes horizontal. ☐

The line goes through the origin. ☐

The line is straight. ☐

6.5.4.1.5 Acceleration

Question 12 · continued

0 2 . 2 After 4 seconds the driver applied the brakes and the car slowed down and stopped.

The distance the car travelled after the brakes were applied is called the braking distance.

Determine the braking distance of the car.

Use **Figure 3**.

[2 marks]

Braking distance = _____ m

The black box also records the deceleration of the car.

0 2 . 3 As the car decelerates, the velocity of the car changes by 16 m/s.

The car decelerates for 2.5 seconds.

Calculate the deceleration of the car.

Use the equation:

$$\text{deceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

[2 marks]

Deceleration = _____ m/s^2

6.5.4.1.5 Acceleration

Question 12 · continued

0 2 . 4 If the black box records large decelerations, it identifies that the driving may be dangerous.

Why can large decelerations be dangerous?

[2 marks]

Tick (✓) **two** boxes.

- The brakes on the car can overheat. ☐
- The driver may lose control of the car. ☐
- The force applied by the brakes is very small. ☐
- The reaction time of the driver increases. ☐
- The thinking distance is very short. ☐

0 2 . 5 The black box monitors the speed of the car.

Describe how speed affects braking distance.

[1 mark]

8

6.5.4.1.5 Acceleration

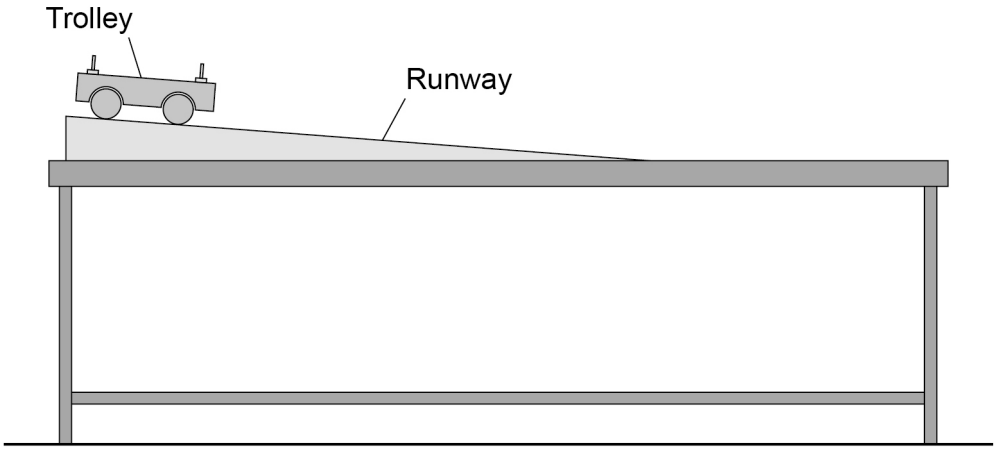
Question 13

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

0 7 A student investigated how the acceleration of a trolley is affected by the force acting on the trolley.

Figure 16 shows some of the equipment used.

Figure 16



6.5.4.1.5 Acceleration

Question 13 · continued

0 7 . 1 Describe a method the student could use.

Your answer should include any extra equipment needed.

[6 marks]

Question 7 continues on the next page

6.5.4.1.5 Acceleration

Question 13 · continued

Table 2 shows one set of results for a similar investigation.

Table 2

Resultant force in newtons	Acceleration in m/s^2
1.2	1.6

0 7 . 2 Which of Newton's laws predicts that the acceleration of the trolley is proportional to the resultant force on the trolley?

[1 mark]

Tick (✓) **one** box.

First law ☐

Second law ☐

Third law ☐

0 7 . 3 Determine the acceleration of the trolley when the resultant force is 3.6 N.

Use **Table 2**.

[2 marks]

Acceleration = _____ m/s^2

6.5.4.1.5 Acceleration

Question 13 · continued

Use the Physics Equations Sheet to answer questions **07.4** and **07.5**.

0 7 . 4 Write down the equation that links acceleration (*a*), mass (*m*) and resultant force (*F*).

[1 mark]

0 7 . 5 A resultant force of 0.42 N acts on a different trolley.

The acceleration of the trolley is 1.2 m/s^2.

Calculate the mass of the trolley.

[3 marks]

Mass of trolley = _____ kg

13

6.5.4.1.5 Acceleration

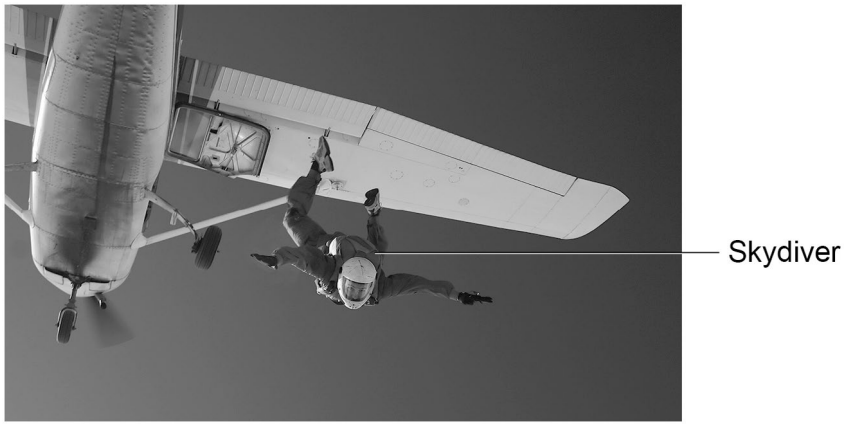
Question 14

June 2024 | 8464/P/2F | Original Q1

0 1 **Figure 1** shows a skydiver jumping from an aeroplane.

The skydiver is accelerating downwards.

Figure 1



0 1 . 1 Which force causes the skydiver to accelerate?

[1 mark]

Tick (✓) **one** box.

- Electromagnetic force ☐
- Gravitational force ☐
- Magnetic force ☐

0 1 . 2 Which force increases as the skydiver accelerates?

[1 mark]

Tick (✓) **one** box.

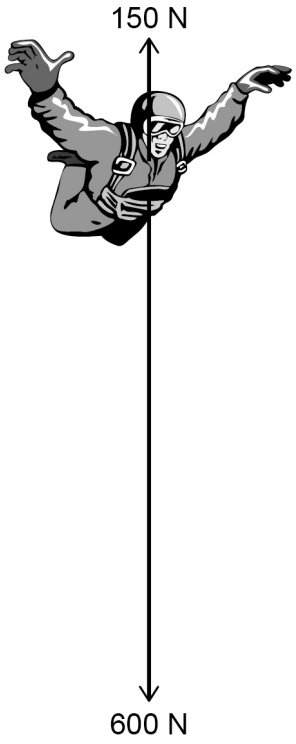
- Air resistance ☐
- Normal contact force ☐
- Tension ☐

6.5.4.1.5 Acceleration

Question 14 · continued

Figure 2 shows the two forces acting on the skydiver a few seconds after jumping from the aeroplane.

Figure 2



0 1 . 3 Calculate the resultant force acting on the skydiver in **Figure 2**.

[1 mark]

Resultant force = _____ N

Question 1 continues on the next page

6.5.4.1.5 Acceleration

Question 14 · continued

0 1 . 4 Eventually the skydiver stops accelerating and falls at a constant velocity.

What is the resultant force acting on the skydiver when falling at a constant velocity?

[1 mark]

Tick (✓) **one** box.

- 0 N ☐
- 150 N ☐
- 600 N ☐

0 1 . 5 What name is given to the constant velocity of the skydiver?

[1 mark]

Tick (✓) **one** box.

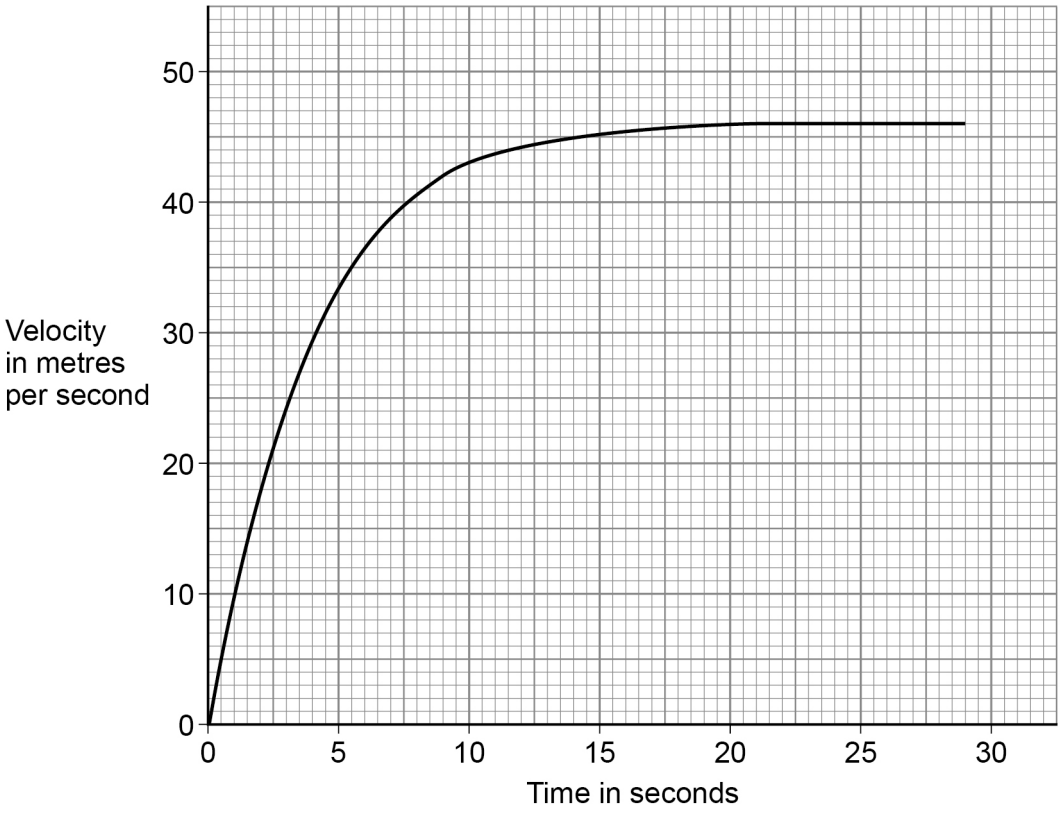
- Average velocity ☐
- Initial velocity ☐
- Terminal velocity ☐

6.5.4.1.5 Acceleration

Question 14 · continued

Figure 3 shows a velocity–time graph for the skydiver.

Figure 3



0 1 . 6 How many seconds did the skydiver accelerate for?

Use **Figure 3**.

[1 mark]

_____ s

0 1 . 7 What was the constant velocity of the skydiver?

Use **Figure 3**.

[1 mark]

_____ m/s

6.5.4.1.5 Acceleration

Question 14 · continued

0 1 . 8 After opening a parachute, the skydiver fell at a constant speed of 3.6 m/s for 25 seconds.

Calculate the distance travelled by the skydiver during this time.

Use the equation:

distance travelled = speed × time

[2 marks]

Distance travelled = _____ m

9

6.5.4.1.5 Acceleration

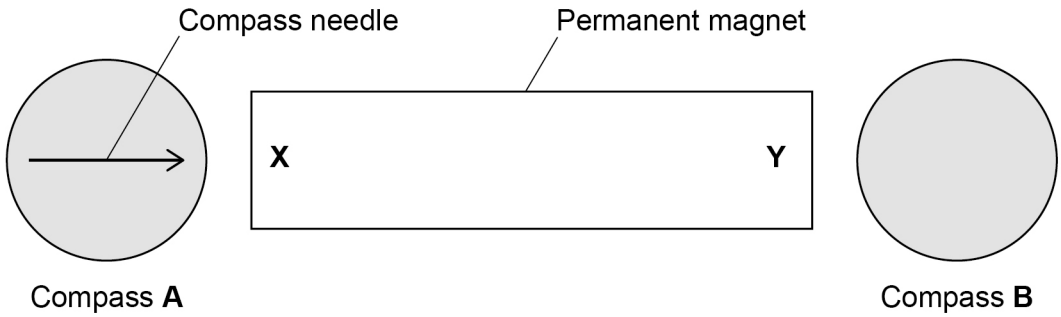
Question 15

June 2024 | 8464/P/2F | Original Q4

0 4 **Figure 8** shows a permanent magnet and two magnetic compasses.

The poles of the magnet are labelled **X** and **Y**.

Figure 8



0 4 . 1 The direction of the compass needle in compass **A** is shown.

Give the names of the poles labelled **X** and **Y** in **Figure 8**.

[2 marks]

X _____

Y _____

0 4 . 2 Draw an arrow on compass **B** in **Figure 8** to show the direction of the magnetic field at that position.

[1 mark]

6.5.4.1.5 Acceleration

Question 15 · continued

Figure 9 shows security tags on some clothes in a shop.

Security tags can be detected if clothes are taken out of the shop with tags still attached.

Figure 9



The tags are attached to the clothes by pins made from a magnetic material.

A shop assistant can use a magnet to remove the pins.

0 4 . 3 Which of the following are magnetic materials?

[2 marks]

Tick (✓) **two** boxes.

- Aluminium ☐
- Copper ☐
- Iron ☐
- Lead ☐
- Nickel ☐
- Tin ☐

6.5.4.1.5 Acceleration

Question 15 · continued

0 4 . 4 Which of the following describes the force between a magnetic material and a magnet?

[1 mark]

Tick (✓) **one** box.

The force is always attractive. ☐

The force is always repulsive. ☐

The force can be either attractive or repulsive. ☐

0 4 . 5 The shop assistant removes a security tag and drops the tag into a collecting bin.

As it falls, the tag accelerates at 9.8 m/s^2.

The mass of the tag is 0.030 kg.

Calculate the resultant force acting on the tag.

Use the equation:

resultant force = mass × acceleration

[2 marks]

Resultant force = _____ N

8

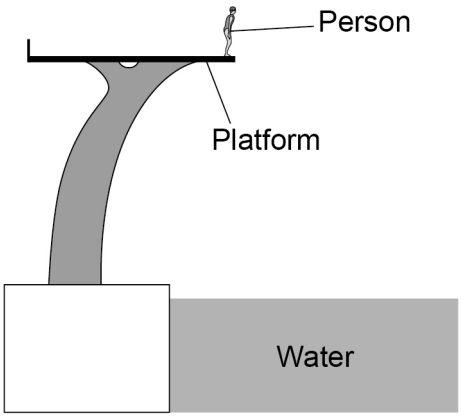
6.5.4.1.5 Acceleration

Question 16

June 2025 | 8464/P/2F | Original Q1

0 1 **Figure 1** shows a person about to dive from a high platform into a pool of water.

Figure 1



0 1 . 1 The person dived from the platform into the water.

The time taken between the person leaving the platform and entering the water was measured by four people.

The measurements were:

2.1 s 1.9 s 1.3 s 2.0 s

Which measurement is anomalous?

[1 mark]

Tick (✓) **one** box.

2.1 s ☐

1.9 s ☐

1.3 s ☐

2.0 s ☐

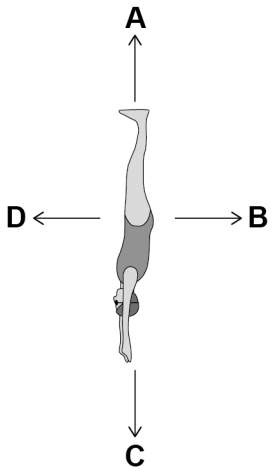
6.5.4.1.5 Acceleration

Question 16 · continued

0 1 . 2 Air resistance acted on the person during the dive.

Figure 2 shows the person moving vertically downwards.

Figure 2



Which arrow on **Figure 2** shows the direction of the air resistance acting on the person?

[1 mark]

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

Question 1 continues on the next page

6.5.4.1.5 Acceleration

Question 16 · continued

0 1 . 3 Air resistance is a contact force.

Which force is also a contact force?

[1 mark]

Tick (✓) **one** box.

Friction ☐

Gravitational force ☐

Magnetic force ☐

0 1 . 4 What happened to the size of the air resistance force as the speed of the person increased?

[1 mark]

0 1 . 5 After entering the water, the person decelerated for a time of 0.35 s.

The deceleration of the person was 60 m/s^2.

Calculate the change in velocity of the person.

Use the equation:

change in velocity = deceleration × time

[2 marks]

Change in velocity = _____ m/s

6.5.4.1.5 Acceleration

Question 16 · continued

0 1 . 6 The mass of the person was 75 kg.

Calculate the resultant force on the person when the deceleration was 60 m/s^2.

Use the equation:

resultant force = mass × deceleration

[2 marks]

Resultant force = _____ N

8

Turn over for the next question

6.5.4.1.5 Acceleration

Question 17

0 3 A student went on a cycling journey that lasted for three days.

The student recorded information about the journey using a cycling app on a mobile phone.

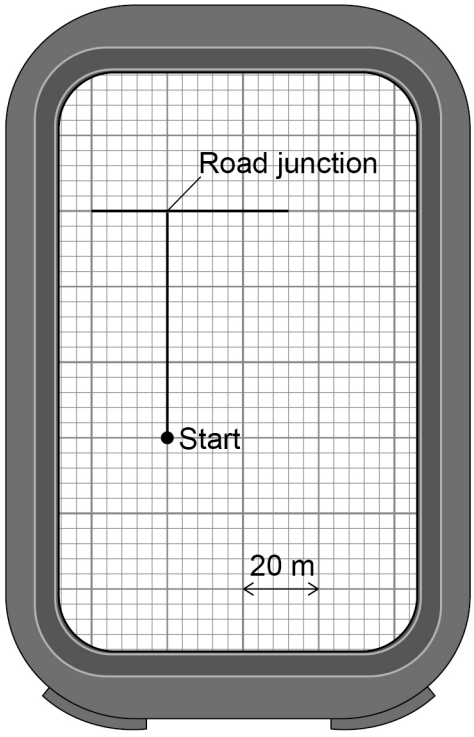
0 3 . 1 At the start of the journey, the student travelled along a straight road to a road junction.

A map on the cycling app showed the road.

Figure 5 shows the map.

The scale of the map is 1 cm **:** 20 m

Figure 5



6.5.4.1.5 Acceleration

Question 17 · continued

Calculate the distance travelled by the student between the start and the road junction.

Use **Figure 5**.

[2 marks]

Distance travelled = _____ m

0 3 . 2 The bicycle had a mass of 15 kg.

gravitational field strength = 9.8 N/kg

Calculate the weight of the bicycle.

Use the equation:

weight = mass × gravitational field strength

[2 marks]

Weight = _____ N

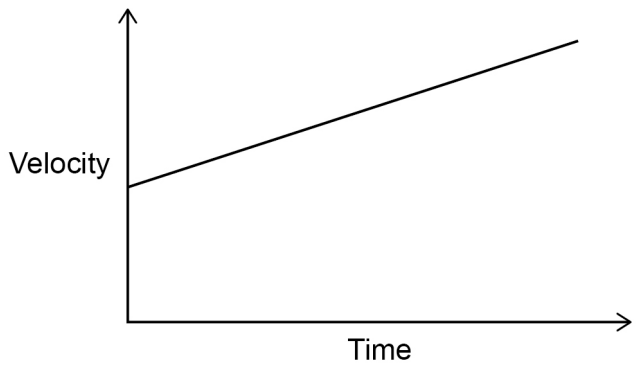
Question 3 continues on the next page

6.5.4.1.5 Acceleration

Question 17 · continued

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]

0 3 . 4 As the student accelerated downhill, the forward force on the student was 250 N.

The work done by the forward force was 4500 J.

Calculate the distance travelled as the student accelerated downhill.

Use the equation:

$$\text{distance travelled} = \frac{\text{work done}}{\text{force}}$$

[2 marks]

Distance travelled = _____ m

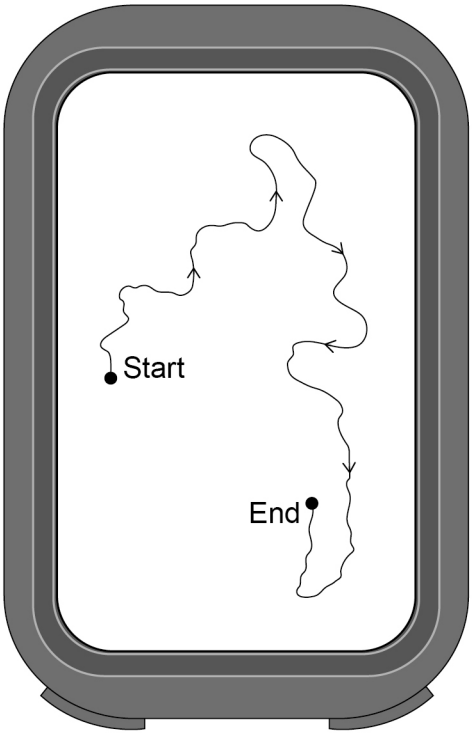
6.5.4.1.5 Acceleration

Question 17 · continued

0 3 . 5 Most of the roads on the journey were not straight.

Figure 7 shows a map of the route taken for the whole journey.

Figure 7



The line in **Figure 7** represents the total distance travelled when the student reached the end of the journey.

How does the total distance travelled compare with the magnitude of the displacement of the student from the start?

[1 mark]

Tick (✓) **one** box.

Total distance travelled is less than the displacement. ☐

Total distance travelled is equal to the displacement. ☐

Total distance travelled is greater than the displacement. ☐

6.5.4.1.5 Acceleration

Question 17 · continued

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

0 3 . 6 Why is distance a scalar quantity?

[1 mark]

Tick (✓) **one** box.

Distance has direction only. ☐

Distance has magnitude only. ☐

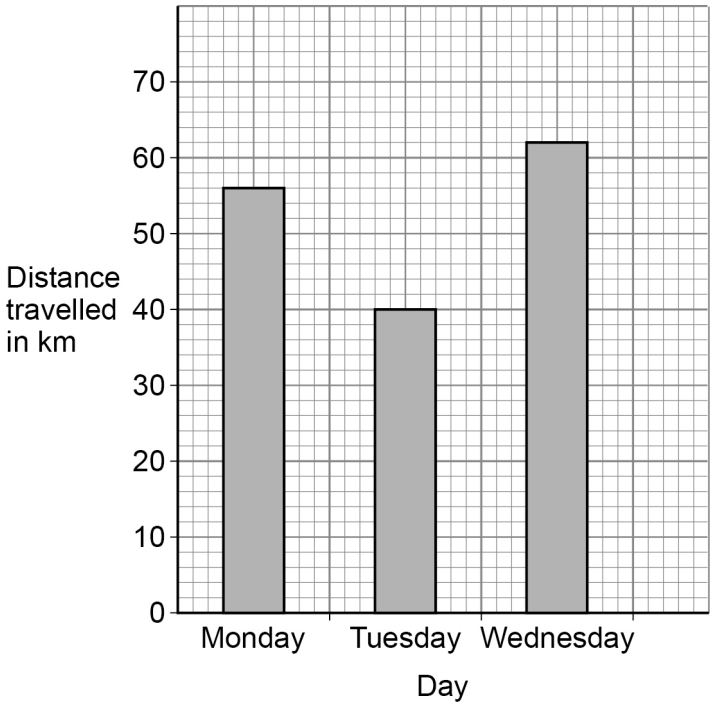
Distance has direction and magnitude. ☐

6.5.4.1.5 Acceleration

Question 17 · continued

0 3 . 7 **Figure 8** shows the distance travelled by the student each day.

Figure 8



Calculate the total distance travelled by the student.

Use **Figure 8**.

[2 marks]

Total distance travelled = _____ km

11