

Motion

Q1.(2018)

Which of the following is the same speed as 7.2 km/h ?

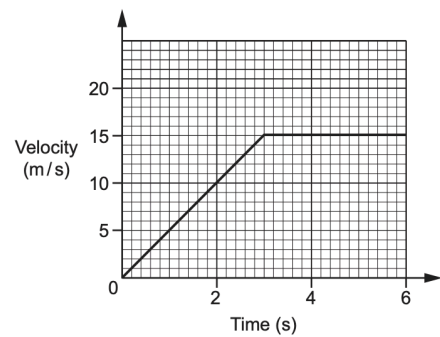
- A 2.0 m/s
- B 20.0 m/s
- C 25.9 m/s
- D 120.0 m/s

Your answer

[1]

Q2.(2018)

Look at the graph below.



Which of the following is the distance travelled between 0 and 6 seconds?

- A 22.5 m
- B 45.0 m
- C 67.5 m
- D 90.0 m

Your answer

[1]

Q3.(2018)

A student measures two forces.

The forces are 5.0 N and 3.0 N. The forces act at 90° to each other.

Draw a scale drawing to determine the resultant force.

Answer = N [3]

Q4.(2019)

Some quantities are vectors and some are scalars.

Which row of the table is correct?

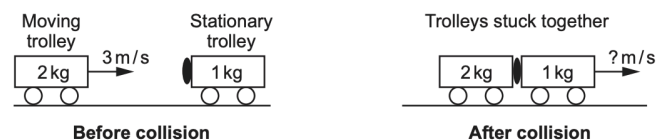
	Vector	Scalar
A	Speed	Displacement
B	Speed	Distance
C	Velocity	Displacement
D	Velocity	Distance

Your answer

[1]

Q5.(2019)

The diagrams show a collision between two trolleys.



Calculate the combined speed of the trolleys **after** the collision.

Use the information in the diagram and the equation: momentum = mass × velocity

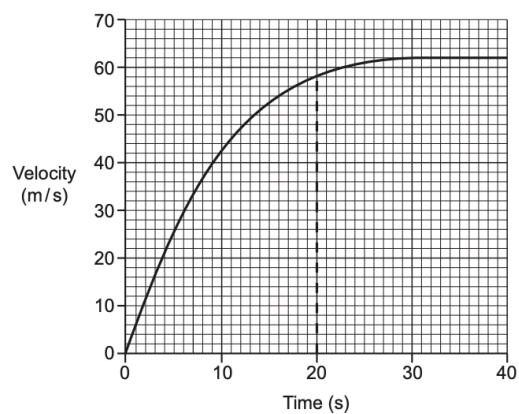
- A 1 m/s
- B 2 m/s
- C 6 m/s
- D 9 m/s

Your answer

[1]

Q6.a(2019)

A car accelerates from rest. This is a graph of the motion of the car on a straight road.



- (a) In the first 20 seconds, the car travels 750 m.

Show that the **total** distance travelled in 40 seconds is approximately 2000 m.

Use the graph to help you.

[2]

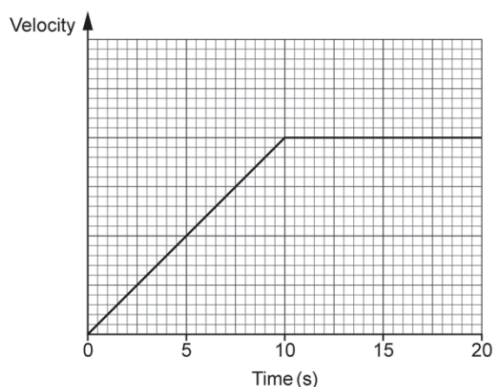
Q6.b(2019)

Calculate the **average speed** for the total journey shown in the graph.

Average speed = m/s [3]

Q7.(2020)

Look at the velocity-time graph for a car during 20 seconds.



Overall, the car travels 390 m.

Use the graph to calculate the **final** velocity of the car.

Final velocity = m/s [3]

Q8.a(2020)

Some students investigate the speed of a trolley down a ramp.

The students do not have light gates, so instead they attach a tape to the trolley and release it down the ramp, as shown in Fig. 16.1.

They also set-up a machine with a timer to make a dot on the tape every 0.02 s.

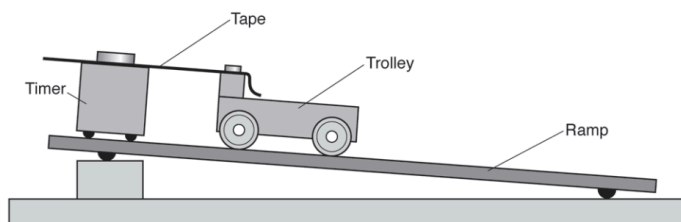


Fig. 16.1

(a) Fig. 16.2 is part of the tape.

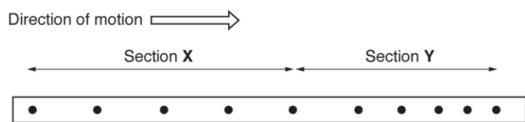


Fig. 16.2

Describe **and** explain the motion of the trolley in each section.

Section X

.....

Section Y

.....

Q8.b(2020)

Fig. 16.3 is part of another tape.

The timer for this tape also makes a dot on the tape every 0.02 s.

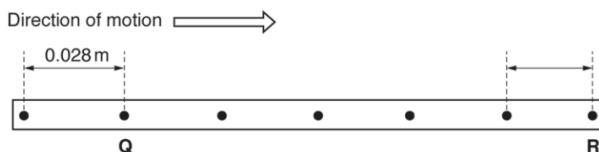


Fig. 16.3

- (i) Use the tape in Fig. 16.3 to calculate the speed of the trolley at point Q.

Use the equation: distance travelled = speed $\times$ time.

Speed at Q = m/s [3]

Q8.c(2020)

In a repeat experiment:

- the speed at Q is 1.3 m/s
- the speed at R is 1.0 m/s.

Use these values and the tape in Fig. 16.3 to calculate the deceleration of the trolley.

Use the equation: deceleration = change in speed $\div$ time.

Deceleration = m/s² [3]

Q8.d(2020)

Fig. 16.4 is tape from another trolley on a different ramp.



Fig. 16.4

The speed of the trolley for this experiment means that the dots on the tape are stretched out. This makes measuring the distances between the dots more difficult.

How can the students measure the speed more accurately?

The students do **not** have any other equipment.

.....
.....
..... [1]

Q9.(2021)

This is a diagram of a collision between two cars.

The cars stick together in the collision.



Which statement is correct?

- A The total momentum after the collision = 8 m/s.
- B The total momentum after the collision = 64 000 J.
- C The total momentum before the collision = 8 000 kg m/s.
- D The total momentum before the collision = 16 000 kg m/s.

Your answer ☐

[1]

Q10.(2021)

A graph with Velocity on the vertical axis and Time on the horizontal axis. The origin is labeled 0. A curve starts at a positive value on the Velocity axis and curves upwards with a constant slope, indicating constant acceleration.

A The object has a constant acceleration.

B The object is accelerating at a decreasing rate.

C The object is accelerating at an increasing rate.

D The object is decelerating.

9

[1]

The diagram shows a rectangular room layout with the following features:

- Overall Dimensions:** The room is 36 m wide and 18 m high.
- Rooms:**
 - Room 2:** Located at the top of the room.
 - Room 1:** Located at the bottom of the room.
- Hall:** A central rectangular area.
- Corridor:** A shaded gray area surrounding the Hall.
- Points X and Y:**
 - Point Y:** Located on the left wall of the Hall.
 - Point X:** Located on the bottom wall of the Hall.

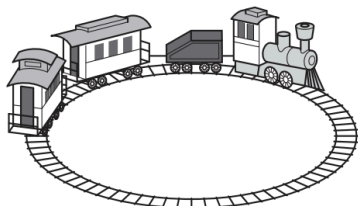
Use calculations to help explain your answer.

[6]

[6]

Q12.(2022)

A toy train moves around a circle of track.
The speed of the toy train is 2 cm/s.



Why is the velocity of the toy train changing?

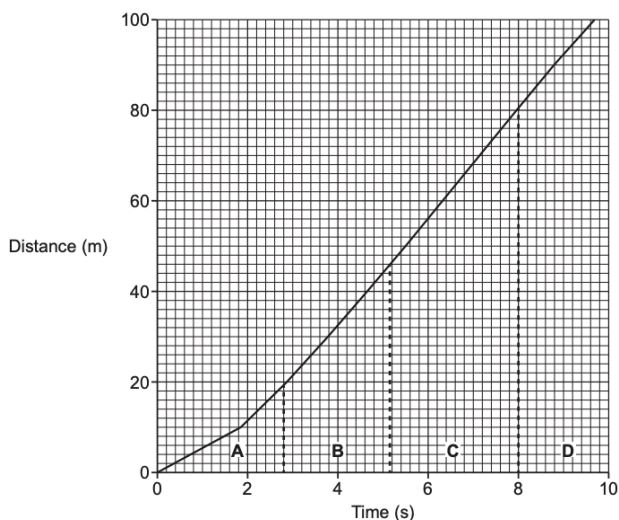
- A Air resistance is acting on the toy train.
- B Force of track on toy train = force of toy train on track.
- C Friction is acting between the track and the toy train.
- D The toy train is changing direction.

Your answer

[1]

Q13.a(2022)

An athlete ran a 100 m sprint.
This is a distance-time graph of the sprint:



(a) Describe the athlete's motion in part A and part C.

A

C

[2]

Q13.b(2022)

After the first 4 seconds, the athlete's speed is 11.5 m/s.
They travelled a distance of 32 m.

Calculate their acceleration during the first 4 seconds.

Use the Data Sheet.

Give your answer to **2** significant figures.

22

Acceleration = m/s² [4]

Q14.(2022)

A teacher teaches their class about momentum.

(a) Define the term **momentum**.

.....
..... [1]

Q15.(2022)

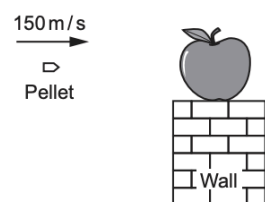
Define the **principle of conservation of momentum**.

.....
..... [1]

Q16.a(2022)

In an experiment, shown in **Fig. 16.1**, the teacher uses a pellet gun to shoot an apple.

Fig. 16.1



The mass of the pellet is 7 grams.

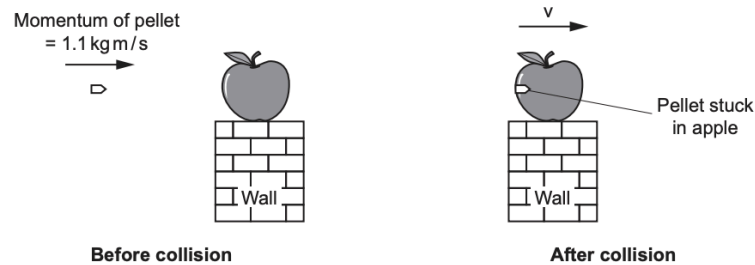
Calculate the momentum of the pellet before it hits the apple.
Use the Data Sheet.

Momentum of pellet = kg m/s [3]

Q16.b(2022)

The teacher repeats the experiment with a different pellet as shown in **Fig. 16.2**.

Fig. 16.2



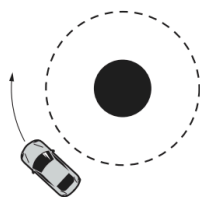
- The pellet becomes stuck in the apple and they move off the wall together.
- The mass of the pellet is 0.011 kg .
- The mass of the apple is 0.089 kg .

Calculate the velocity of the pellet and apple after the collision.
Use the Data Sheet.

Velocity of pellet and apple = m/s [3]

Q17.(2023)

A car travels around a roundabout at 20 mph .



Why is the car accelerating?

- A The direction of the car is changing.
- B The forces on the car are balanced.
- C The mass of the car is decreasing.
- D The speed of the car is changing.

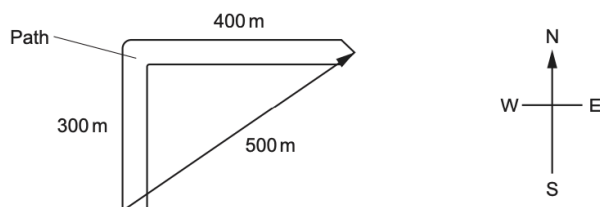
Your answer

☐

[1]

Q18.(2023)

A child walks 300 m north along a path. The path turns through a 90° angle. They then walk another 400 m east.



Which statement is correct?

- A The total displacement is 500 m.
- B The total displacement is 700 m.
- C The total distance travelled is 500 m.
- D The total distance travelled is 1200 m.

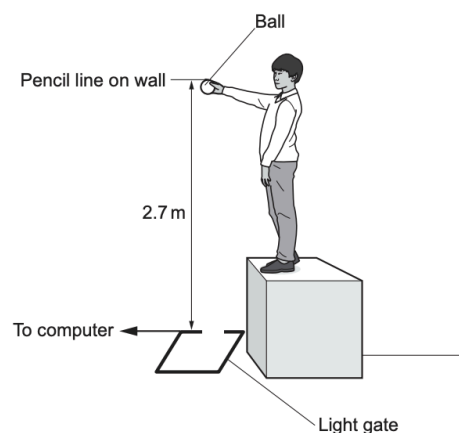
Your answer

[1]

Q19.a(2023)

A student measures the acceleration due to gravity by dropping a ball through a light gate.

The diagram shows the experiment.



(a) Put the steps in the correct order to describe a method for the experiment.

Write numbers 1–4 in the boxes below. Step 5 has been filled in for you.

- Write down the computer's value for the final velocity.
- Make a pencil line on the wall.
- Measure a height of 2.7 m with a tape measure.
- 5 Use $(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$ to calculate the acceleration due to gravity.
- Drop the ball through the light gate.

[1]

Q19.b(2023)

Draw lines to match each **source of error** in the experiment to the correct **way to remove the error**.

Source of error	Way to remove the error
The ball is thrown downwards.	Hold the ball in a clamp stand and loosen the clamp to release.
The ball is dropped from the wrong height.	Repeat the same measurement 3 times.
The computer calculates the wrong velocity.	Make sure the ball is dropped through the centre of the light gate.
	Make sure the ball is at the same level as the pencil line.

[2]

Q19.c(2023)

The light gate and computer are used to calculate the final velocity of the ball.

(i) What information does the student have to enter into the computer?

..... [1]

Q19.d(2023)

The computer displays a final velocity of 7.2 m/s when the student drops the ball from 2.7 m.

Calculate a value for the acceleration due to gravity.

Use the equation: $(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$

Acceleration due to gravity = m/s² [3]

Q20.(2024)

Which row describes the difference between a vector quantity and a scalar quantity?

	Has magnitude	Has direction
A	scalar only	vector only
B	vector and scalar	vector only
C	vector and scalar	scalar only
D	vector only	vector and scalar

Your answer

[1]

Q21.(2024)

Four cars are travelling along a road.

Which car has the **highest** momentum?

Use the equation: momentum = mass $\times$ velocity

	Mass of car (kg)	Velocity of car (m/s)
A	1000	5
B	1000	10
C	2000	5
D	2000	10

Your answer

[1]