

Q1. (2018)

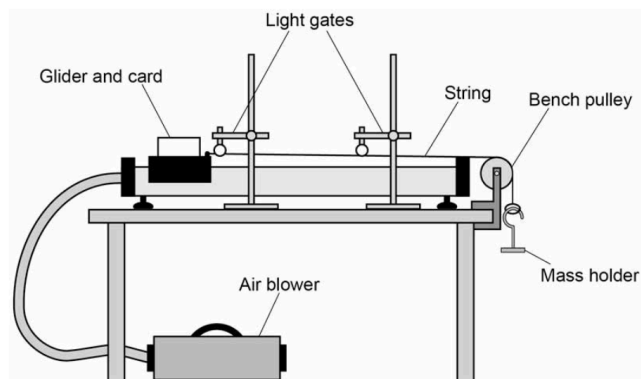
0 1

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 1 shows the apparatus.

Figure 1



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.

a)

0 1 . 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.

☐

b)

0 1 . 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]

c)

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 1 shows the results.

Table 1

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 1 . 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 2**

Table 2

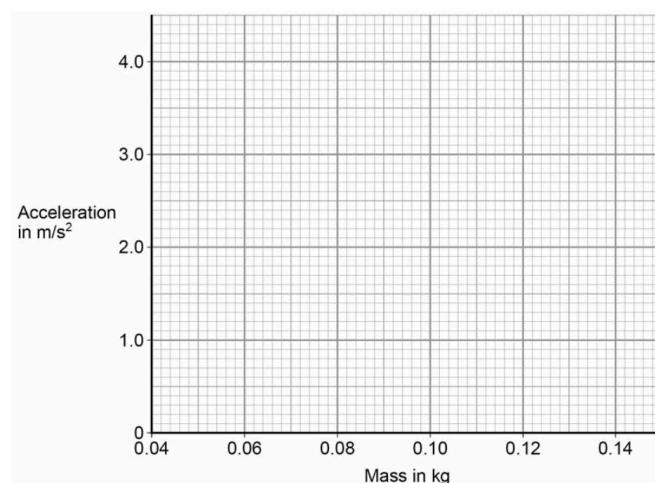
Mass of the glider in kg	Acceleration in m/s^2
0.060	3.5
0.080	2.6
0.10	2.0
0.12	1.7
0.14	1.4

Plot the results on **Figure 2**

Draw a line of best fit.

[3 marks]

Figure 2



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]

Q3. (2019)

0 1

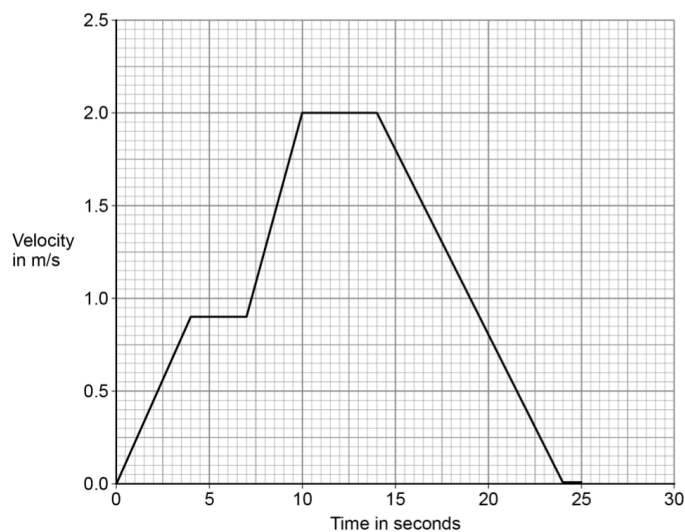
Figure 1 shows a runner using a smart watch and a mobile phone to monitor her run.

Figure 1



Figure 2 is a velocity–time graph for part of the runner's warm-up.

Figure 2



a)

0 1 . 1

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

[2 marks]

Time = _____ s

b)

0 1 . 2 Determine the deceleration of the runner.

[2 marks]

Deceleration = _____ m/s^2

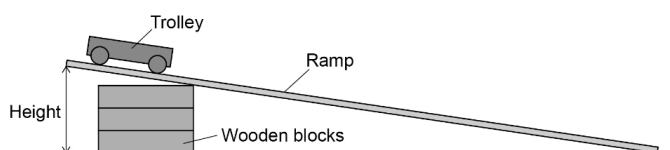
Q4. (2020)

0 2

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

Figure 3 shows some of the equipment used.

Figure 3



a)

0 2 . 1

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

[6 marks]

b)

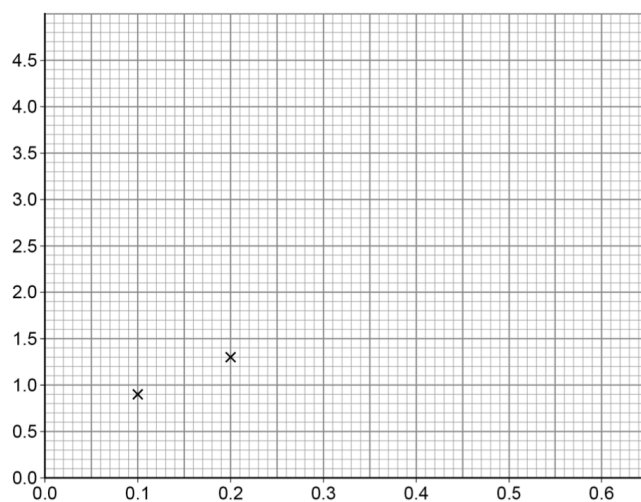
Table 1 shows the results.

Table 1

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 4.

Figure 4



0 2 . 2

Complete Figure 4.

You should:

- label the axes
- plot the remaining results from Table 1
- draw a line of best fit.

[4 marks]

Q5. (2021)

0 2

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

Figure 2 shows a player wearing a tracking device.

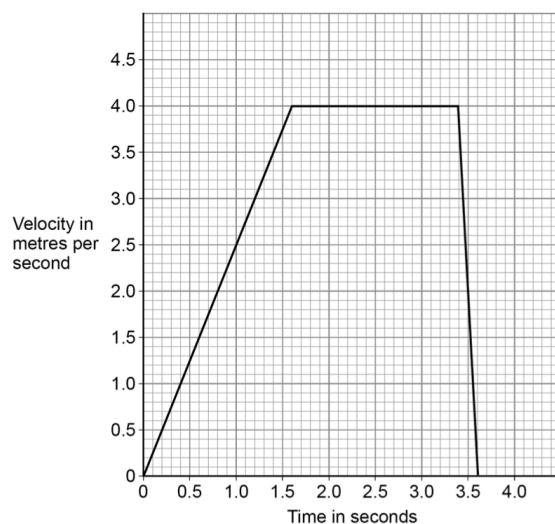
The player is tackling another player who is running with the ball.

Figure 2



Figure 3 shows a velocity–time graph for the player running with the ball.

Figure 3



a)

0 2 . 3

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

[2 marks]

b)

0 2 . 4

Describe the motion of the player between 3.4 s and 3.6 s.

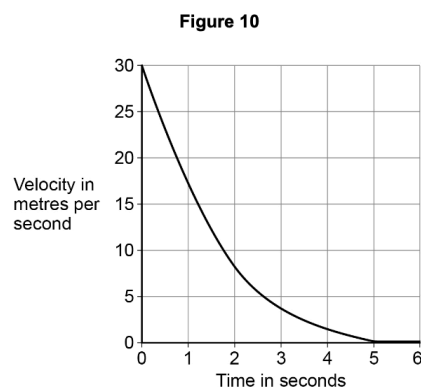
[1 mark]

Q6. (2022)

0 6

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

Figure 10 shows how the velocity of a car changes during braking.



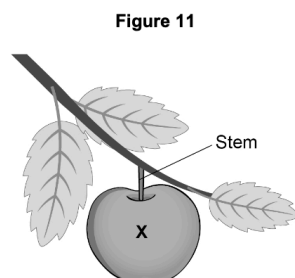
0 6 . 3 Explain how the gradient of the line on **Figure 10** shows that the resultant force on the car was **not** constant.

[3 marks]

Q7. (2022)

0 7 **Figure 11** shows a stationary apple hanging from a tree.

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



0 7 . 2 It takes 0.50 s for the apple to fall to the ground.

The initial velocity of the apple is 0 m/s

acceleration due to gravity = 9.8 m/s^2

Calculate the distance fallen by the apple.

Use the Physics Equations Sheet.

[6 marks]

Q8. (2023)

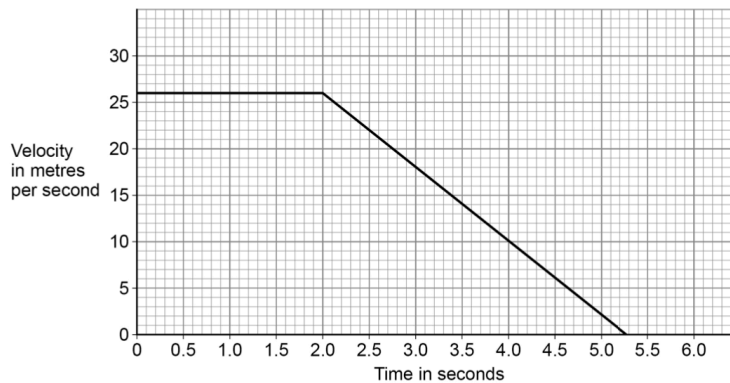
0 7

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



a)

0 7 . 1

Determine the deceleration of the car.

Give the unit.

[3 marks]

b)

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]

Q9. (2024)

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]

Q10. (2024)

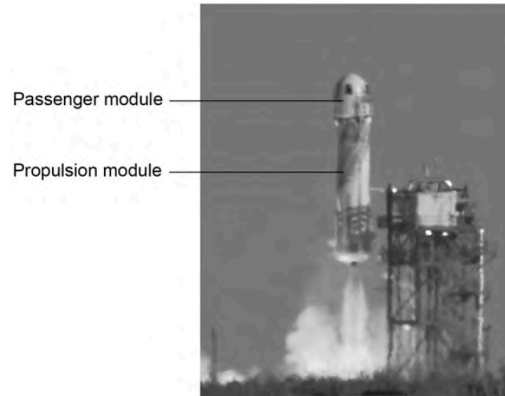
0 6

Rockets have been developed so that people who are not trained astronauts can pay to travel to space.

Figure 9 shows the passenger module and the propulsion module of a rocket.

The propulsion module burns a large volume of fuel.

Figure 9



0 6 . 1

The rocket was initially stationary on the ground.

Then the rocket accelerated upwards until it reached a height of 40 km.

The constant acceleration of the rocket was 6.48 m/s^2 .

Calculate the velocity of the rocket at a height of 40 km.

Use the Physics Equations Sheet.

[4 marks]