PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

PHYSICS



EXAM QUESTION PACK

TOPIC 2: MOTION AND FORCES (PAPER 1)

SCORE	PERCENTAGE
/161	%

STEMUP

These questions belong to Pearson Edexcel, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by Pearson Edexcel. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with Pearson Edexcel and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. Pearson Edexcel has not endorsed, approved or been involved in the production of it. Pearson Edexcel and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

Pearson Edexcel publishes its past papers, mark schemes and examiner reports. Always check the current specification at qualifications.pearson.com before you revise, because content and wording can change between series.

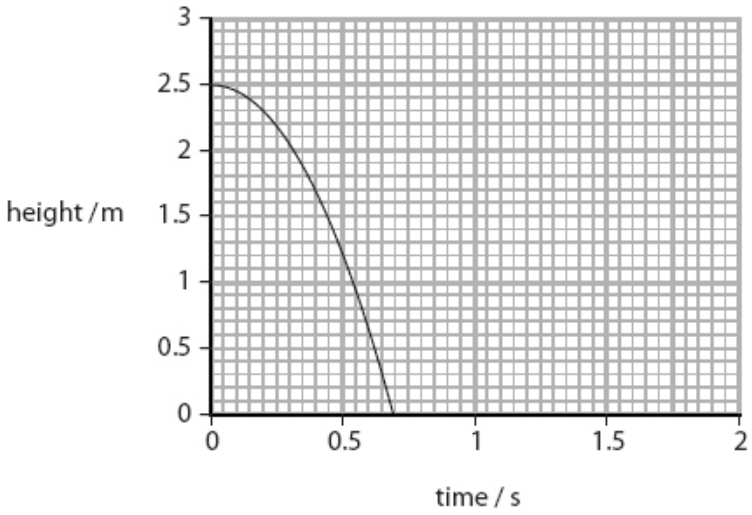
If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Q1.

The man in the photograph balances a ball above the ground.



He lets the ball fall.
He starts a timer at the same time.
The graph shows how the height of the ball above the ground changes with time.



(i) From the graph, state the height of the ball above the ground when the timer was started.

(1)

height above ground = ...m

(ii) From the graph, state the time taken for the ball to reach the ground.

(1)

time =..... .s

(iii) The ball bounces back to a height of 1.9 m.
Continue the line on the graph to show this.

(3)

(iv) Explain why the ball does not bounce back to its original height.

(2)

.....

.....

.....

.....

(**Q10 1SC0/1PH, June 2013**)

Q2.

Figure 10 shows two students investigating reaction times.

Student B supports his left hand on a desk.

Student A holds a ruler so that the bottom end of the ruler is between the finger and thumb of student B.

When student A releases the ruler, student B catches the ruler as quickly as he can with his left hand.

The investigation is repeated with the right hand of student B.

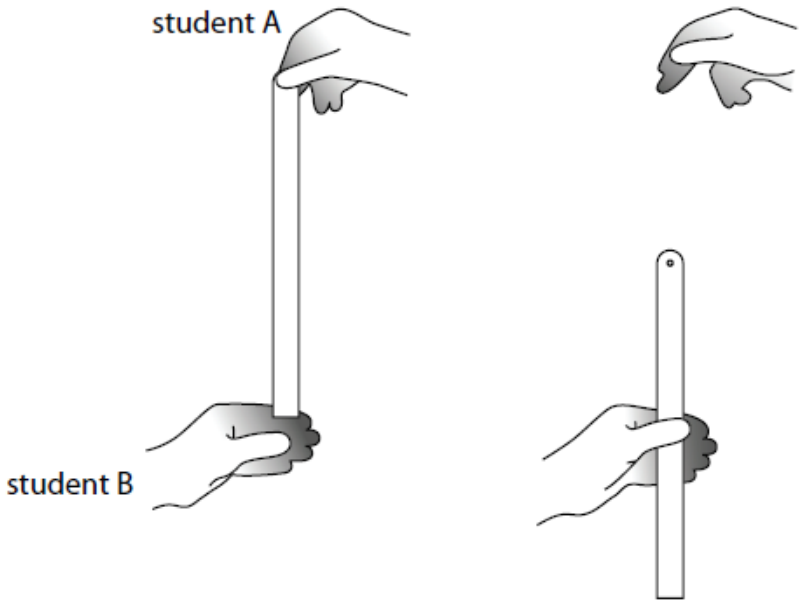


Figure 10

(a) Give a reason why it is better to have the 0 cm mark at the bottom of the ruler rather than at the top.

(1)

.....

.....

(b) Give a reason why two students are needed for this investigation.

(1)

.....

.....

(c) The students took five results for the left hand and five results for the right hand.

Figure 11 shows their results.

which hand	distance dropped (cm)					
	trial 1	trial 2	trial 3	trial 4	trial 5	average
left	10.1	25.5	18.4	14.6	11.7	14
right	17.5	16.1	19.4	18.6	20.2	.....

Figure 11

(i) Calculate the average distance dropped for the right hand. Give your answer correct to 2 significant figures.

(2)

distance = ... cm

(ii) Calculate the average time for the left hand.

Use the equation

$$\text{time}^2 = \frac{\text{distance}}{500}$$

(2)

average time = ... s

(d) Explain whether any of the readings are anomalous.

(2)

.....

.....

.....

.....

(e) Give **two** ways that the students can improve the quality of their data, other than ignoring anomalous results.

(2)

1 .....

.....

2 .....

.....

(f) Describe how the students could develop their investigation to investigate how reaction time changes with another variable.

(2)

.....

.....

.....

.....

(Total for question = 12 marks)

(**Q05 1SC0/1PF, SAM 2016**)

Q3.

Figure 4 shows two students investigating their reaction times.

Student B supports his left hand on a desk.

Student A holds a ruler so that the bottom end of the ruler is between the finger and thumb of student B.

When student A releases the ruler, student B catches the ruler as quickly as he can.

The investigation is repeated with the right hand of student B.

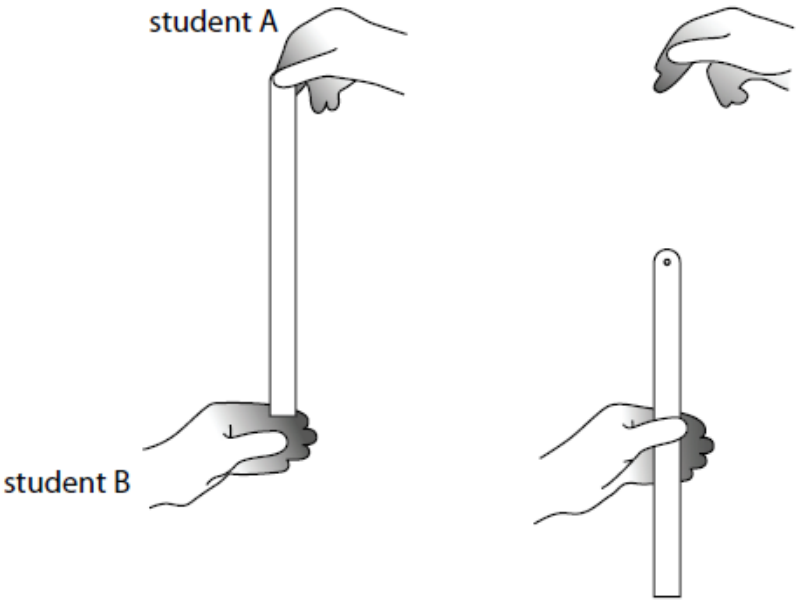


Figure 4

(a) The students took five results for the left hand and five results for the right hand.

Figure 5 shows their results.

which hand	distance dropped (cm)					
	trial 1	trial 2	trial 3	trial 4	trial 5	average
left	10.1	25.5	18.4	14.6	11.7	14
right	17.5	16.1	19.4	18.6	20.2	.....

Figure 5

(i) Calculate the average distance dropped for the right hand.

Give your answer correct to 2 significant figures.

(2)

distance = ... cm

(ii) Calculate the average time for the left hand.

Use the equation

$$\text{time}^2 = \frac{\text{distance}}{500}$$

(2)

average time = ... s

(b) Explain whether any of the readings are anomalous.

(2)

.....

.....

.....

.....

(c) Give **two** ways that the students can improve the quality of their data other than ignoring anomalous results.

(2)

1 .....

.....

2 .....

.....

(d) Describe how the students could develop their investigation to investigate how reaction time changes with another variable.

(2)

.....

.....

.....

.....

.....

.....

(Total for question = 10 marks)

(**Q02 1SC0/1PH, SAM 2016**)

Q4.

Figure 10 shows a footballer and a ball.



(Source: © GelgelNasution/Shutterstock)

Figure 10

The ball is stationary before it is kicked.

The mass of the ball is 0.43 kg.

The kick exerts a force of 2700 N on the ball.

The velocity of the ball just after it has been kicked is 36 m/s.

(i) Calculate the momentum of the ball just after it has been kicked.

State the unit for momentum.

(3)

momentum = ...

unit .....

(ii) Calculate the amount of time that the footballer's kicking foot is in contact with the ball.

(2)

time = ... s

(iii) Explain how Newton's third law applies to the interaction between the kicking foot and the football.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 8 marks)

(**QU05a 1SC0/1PH, June 2025**)

Q5.

Figure 6 shows apparatus set up to investigate the speed of a falling object.

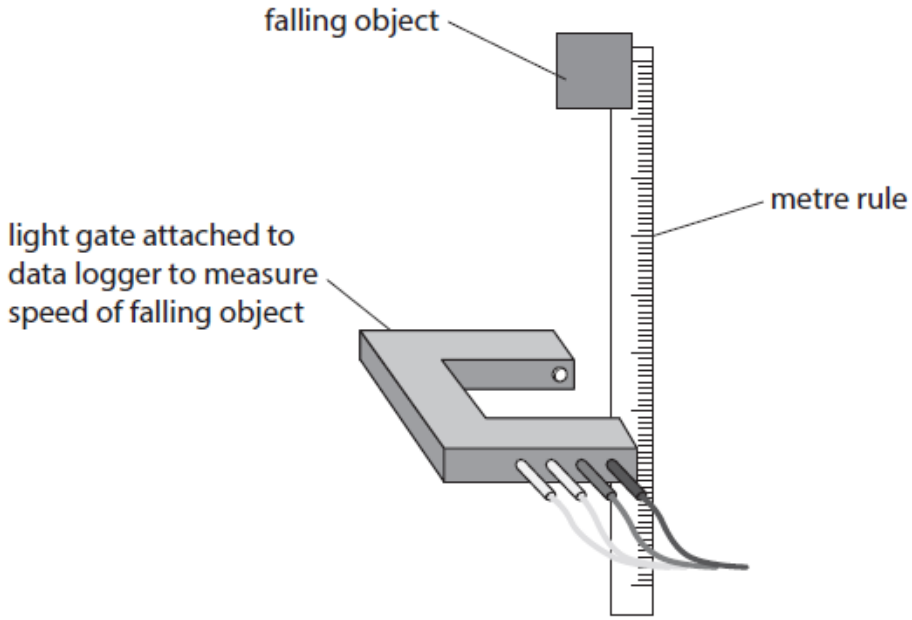


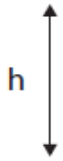
Figure 6

The object is dropped from rest at the position shown.
The object falls through the light gate.

(i) The speed of the object, after it has fallen through a height, h, is measured by the light gate.

Label Figure 6 to show the height, h.
Your label should look like this

(1)



(ii) The speed is measured at least four times for each drop height.

Give **one** reason for repeating the measurements.

(1)

.....

.....

(iii) The metre rule shown in Figure 6 is used to measure the height, h.

Suggest **two** ways to make the measurement of h as accurate as possible.

(2)

1 .....

.....

2 .....

.....

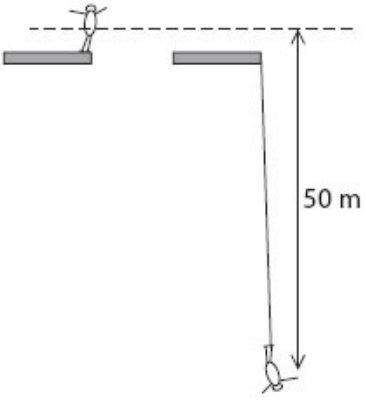
(Total for question = 4 marks)

(**QU04a 1SC0/1PF, June 2025**)

Q6.

A 60 kg student weighs 600 N.
He does a bungee jump.





The bungee cord becomes straight and starts to stretch when he has fallen 50 m.

Complete the sentence by putting a cross (☒) in the box next to your answer.

When his speed is 10 m/s his momentum is

(1)

☒ **A** 600 kg m/s

☒ **B** 3 000 kg m/s

☒ **C** 6 000 N m/s

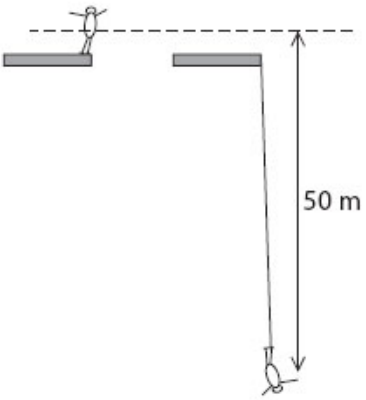
☒ **D** 30 000 N m/s

(**Q05 1SC0/1PH, June 2013**)

Q7.

A 60 kg student weighs 600 N.
He does a bungee jump.





The bungee cord becomes straight and starts to stretch when he has fallen 50 m.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

He first stops moving

(1)

☒ **A** before all the energy has disappeared

☒ **B** before the bungee cord starts to stretch

☒ **C** when the bungee cord is stretched the most

☒ **D** when the elastic potential energy is zero

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

When his speed is 10 m/s his momentum is

(1)

☒ **A** 600 kg m/s

☒ **B** 3 000 kg m/s

☒ **C** 6 000 N m/s

☒ **D** 30 000 N m/s

(c) (i) Calculate the change in gravitational potential energy as the student falls 50 m.

Give the unit.

(3)

change in gravitational potential energy = ...unit ..... .

(ii) State at what point in the bungee jump the student has maximum kinetic energy.

(1)

.....

.....

(iii) Explain why his maximum kinetic energy is likely to be less than your answer to (c)(i).

(2)

.....

.....

.....

(Total for Question = 8 marks)

(**Q03 1SC0/1PH, June 2013**)

Q8.

Figure 6 shows a different velocity/time graph.

This straight line graph can be represented by the equation

$$y = mx + c$$

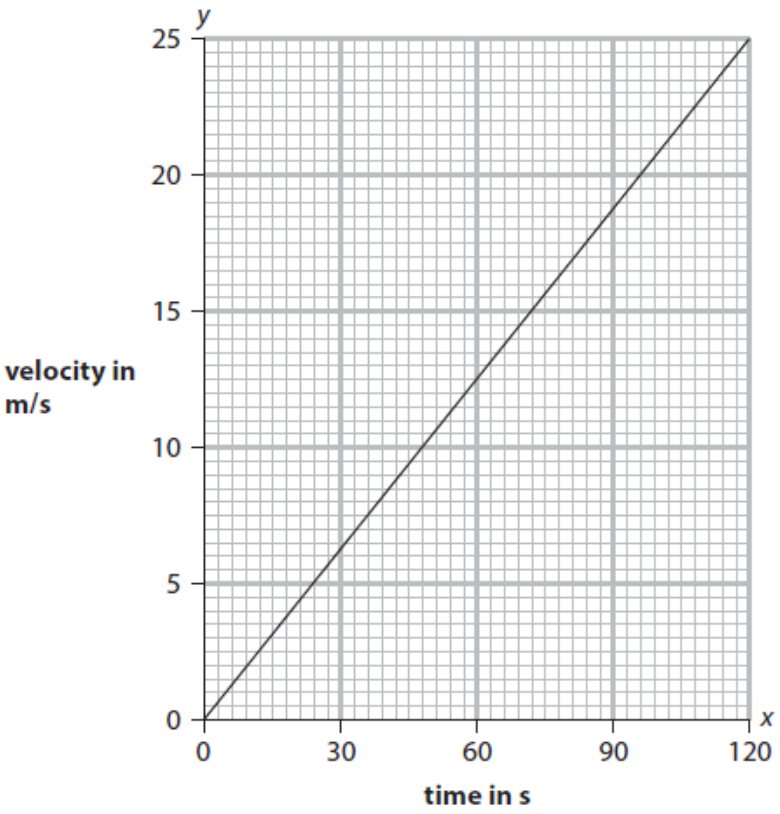


Figure 6

(i) Give the quantities that x and y represent in the equation.

(1)

x represents .....

y represents .....

(ii) Calculate the value of m from the graph in Figure 6.

(2)

m = ... m/s^2

(iii) State the value of c from the graph in Figure 6.

(1)

value of c = ...

(Total for question = 4 marks)

Q9.

A student has some cupcake cases.

One cupcake case is shown in Figure 7.



(Source: © Anton Starikov/Shutterstock)

Figure 7

The student drops a stack of cupcake cases with the base facing downwards, as shown in Figure 8.



(Source: © Elena Schweitzer/Shutterstock)

Figure 8

The speed of the falling stack of cupcake cases depends on the number of cupcake cases in the stack.

(i) The student also has a stop clock and a metre rule.

Describe an investigation to show how the speed of the falling stack of cupcake cases depends on the number of cupcake cases in the stack.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

(ii) A stack of cupcake cases has a mass of 0.005 kg.

Calculate the weight, in newtons, of the stack of cupcake cases.

Gravitational field strength = 10 N / kg

(2)

Use the equation

$$W = mg$$

weight = ... N

Figure 9 shows a cupcake case that is falling at a constant velocity.

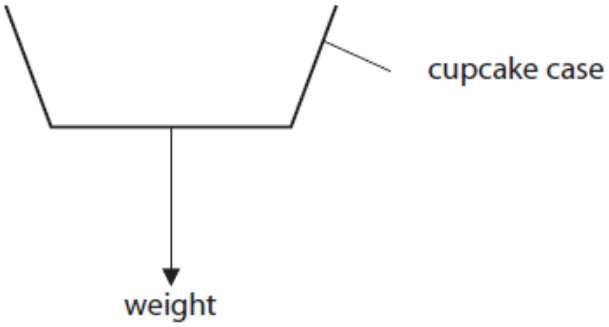


Figure 9

(iii) Draw an arrow on Figure 9 to show the force due to air resistance on the cupcake case.

(1)

(iv) State the value of the acceleration of the cupcake case when it is falling at a constant velocity

(1)

.....

(Total for question = 8 marks)

(**QU05b 1SC0/1PF, June 2023**)

Q10.

A student has some cupcake cases.

One cupcake case is shown in Figure 1.



(Source: © Anton Starikov/Shutterstock)

Figure 1

The student drops a stack of cupcake cases with the base facing downwards, as shown in Figure 2.



(Source: © Elena Schweitzer/Shutterstock)

Figure 2

The speed of the falling stack of cupcake cases depends on the number of cupcake cases in the stack.

(i) The student also has a stop clock and a metre rule.

Describe an investigation to show how the speed of the falling stack of cupcake cases depends on the number of cupcake cases in the stack.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

(ii) A stack of cupcake cases has a mass of 0.005 kg.

Calculate the weight, in newtons, of the stack of cupcake cases.

Gravitational field strength = 10 N / kg

(2)

Use the equation

$$W = mg$$

weight = ... N

Figure 3 shows a cupcake case that is falling at a constant velocity.

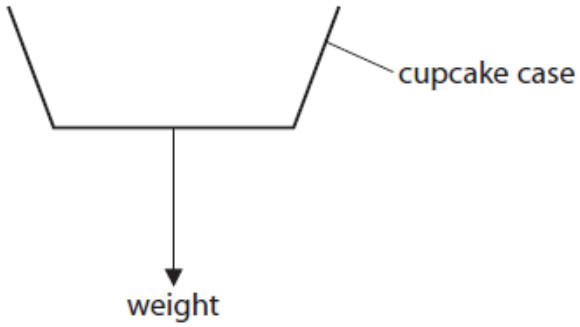


Figure 3

(iii) Draw an arrow on Figure 3 to show the force due to air resistance on the cupcake case.

(1)

(iv) State the value of the acceleration of the cupcake case when it is falling at a constant velocity.

(1)

.....

(Total for question = 8 marks)

(**QU01b 1SC0/1PH, June 2023**)

Q11.

Figure 10a shows a box falling towards a hard floor.

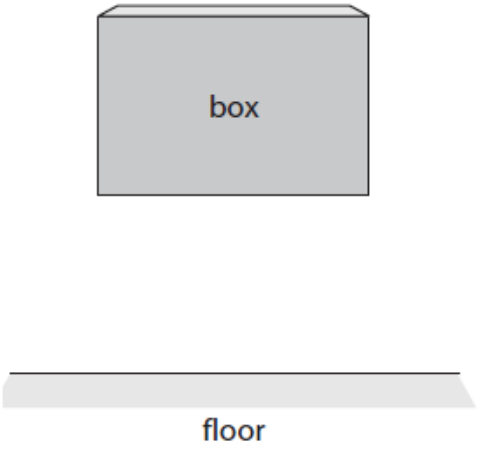


Figure 10a

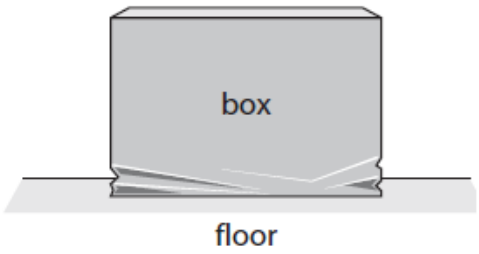


Figure 10b

The box hits the floor and crumples a little before it comes to rest as shown in Figure 10b.

The momentum of the box just before it hits the floor is 8.7 kg m/s.

The box comes to rest 0.35 s after it first hits the floor.

(i) Calculate the magnitude of the force exerted by the floor on the box.

Use an equation selected from the list of equations at the end of this paper.

(2)

force exerted by the floor on the box = ... N

(ii) State the magnitude and direction of the force exerted by the box on the floor.

(2)

magnitude .....

direction .....

(Total for question = 4 marks)

(**Q05c 1SC0/1PH, Nov 2021**)

Q12.

A car driver sees a rabbit on the road.

The driver makes an emergency stop after he sees the rabbit.

Figure 6 shows the speed of the car from the time the driver sees the rabbit until the car stops.

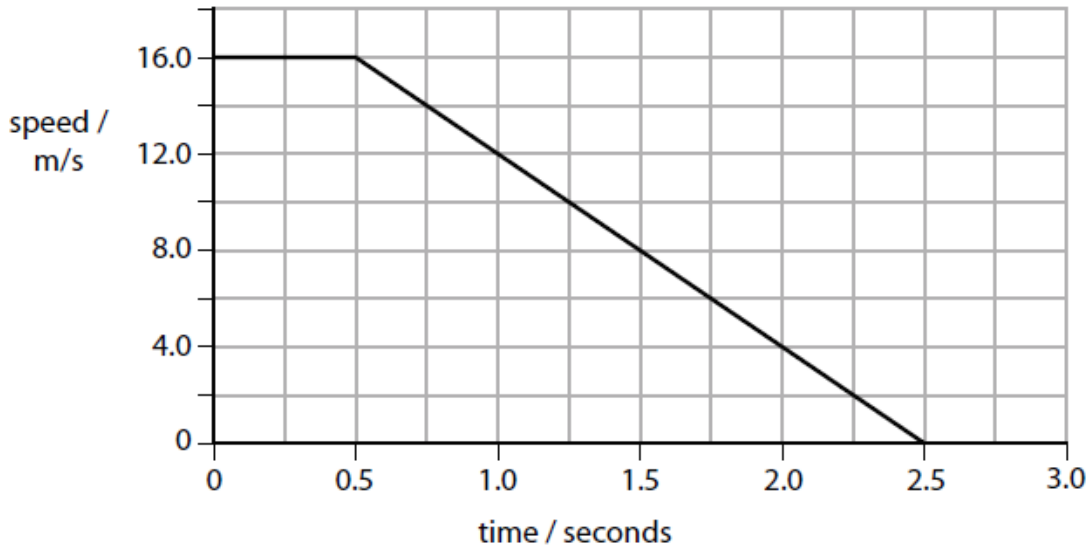


Figure 6

Calculate the distance that the car travels in the first 0.5 seconds.

(3)

distance = ... m

(Total for question = 3 marks)

(**Q04aii 1SC0/1PF, SAM 2016**)

Q13.

A student investigates the motion of a trolley along a horizontal runway using the apparatus in Figure 2.

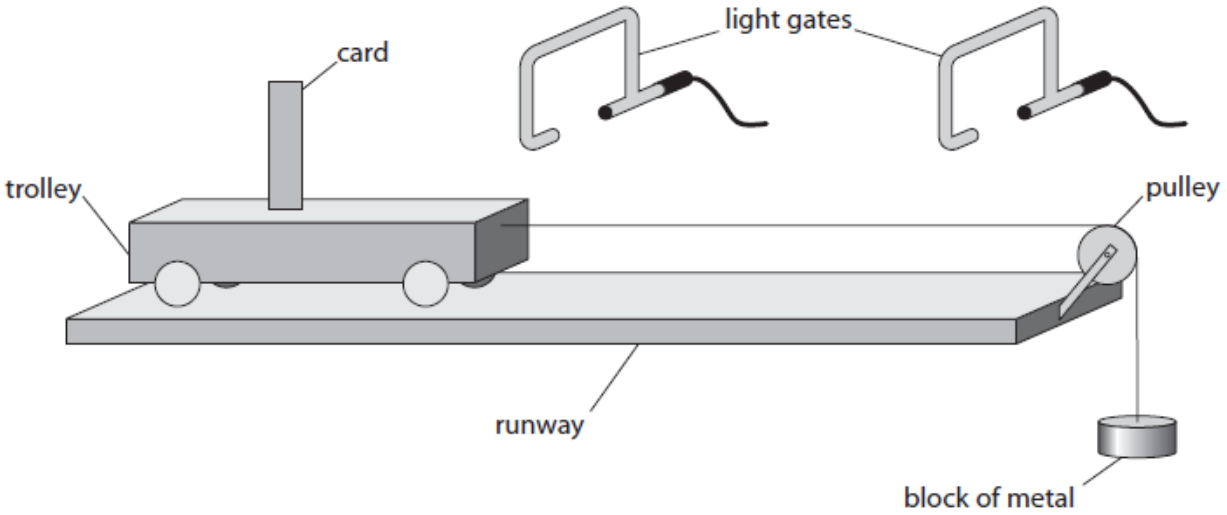


Figure 2

A trolley is attached to a string passing over a pulley.

A block of metal hangs on the end of the string.

Each light gate measures the time it takes for the card to pass through the gate.

When the trolley is released, it moves along the track.

A computer measures the time it takes for the card to pass between each light gate.

Figure 3 shows a graph of acceleration against force for three trollies of different mass that are pulled along the runway.

The graphs for the trollies are labelled P, Q and R.

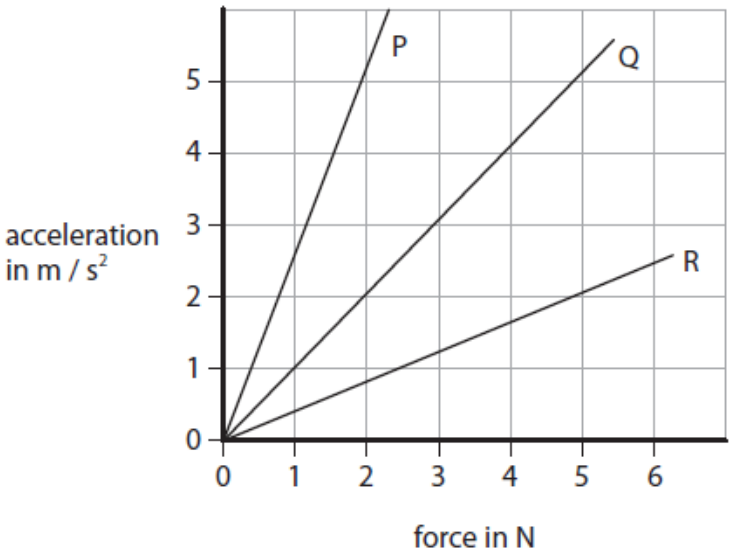


Figure 3

Use the information from the graph.

(i) Calculate the mass of trolley Q

(2)

mass of trolley Q = ... kg

(ii) Describe how the graph shows that trolley R has the greatest mass.

(2)

.....

.....

.....

.....

.....

(Total for question = 4 marks)

(**Q02b 1SC0/1PF, SAM**)

Q14.

Figure 8 shows two ice skaters during a performance.



Figure 8

(i) The two ice skaters are travelling together in a straight line at 3.50 m/s.

Their total momentum is 371 kgm/s.

The man has a mass of 64.5 kg.

Calculate the mass of the woman.

(4)

mass = ... kg

(ii) Calculate the kinetic energy of the man.

(2)

kinetic energy = ... J

(Total for question = 6 marks)

(**Q06a 1SC0/1PH, SAM**)

Q15.

A student investigates the motion of a trolley along a horizontal runway using the apparatus in Figure 2.

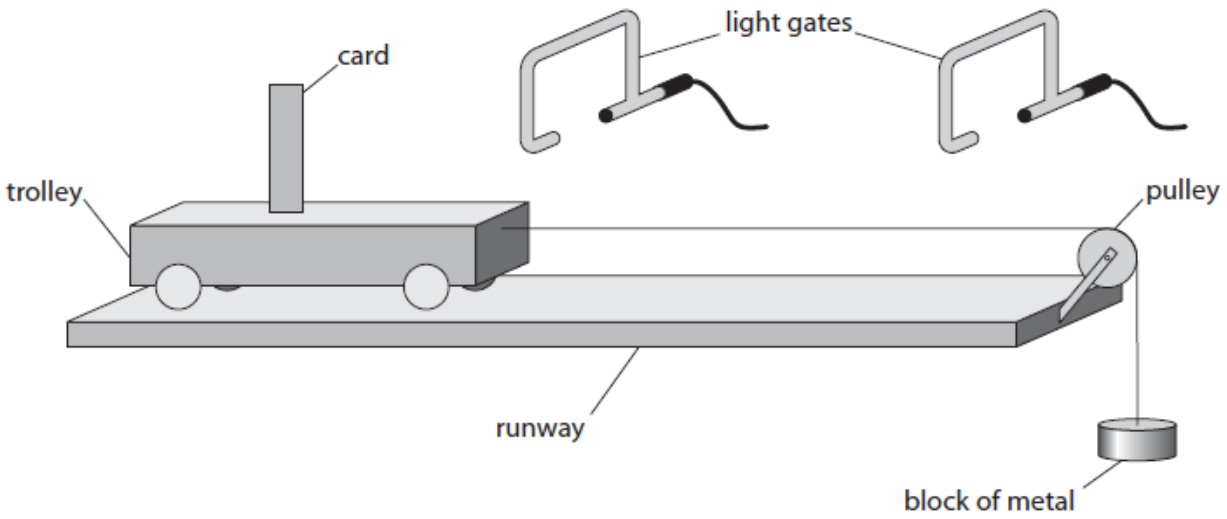


Figure 2

A trolley is attached to a string passing over a pulley.

A block of metal hangs on the end of the string.

Each light gate measures the time it takes for the card to pass through the gate.

When the trolley is released, it moves along the track.

A computer measures the time it takes for the card to pass between each light gate.

(i) The card took 0.080 s to pass through the first light gate.

The width of the card is 5 cm.

Calculate the average speed, in m/s, of the trolley through the first light gate.

(2)

average speed = ... m/s

Another trolley passes through the first light gate at a velocity of 0.72 m/s.

This trolley passes through the second light gate at a velocity of 1.1 m/s.

The time it takes for the card on the trolley to travel between the two light gates is 0.53 s.

(ii) State the equation relating acceleration, change in velocity and time.

(1)

(iii) Calculate the acceleration of the trolley between the two light gates.

(2)

acceleration = ... m/s^2

(Total for question = 5 marks)

(**Q02a 1SC0/1PF, SAM**)

Q16.

A car is travelling down a slope at 2.0 m/s.

The car accelerates for 4.0 s.

The speed of the car increases to 12 m/s.

Calculate the acceleration of the car.

Use the equation

$$a = \frac{(v - u)}{t}$$

(2)

acceleration of the car = ... m/s^2

(Total for question = 2 marks)

(**Q03d 1SC0/1PF, Nov 2021**)

Q17.

Figure 4 shows a velocity / time graph for a car moving on a test track.

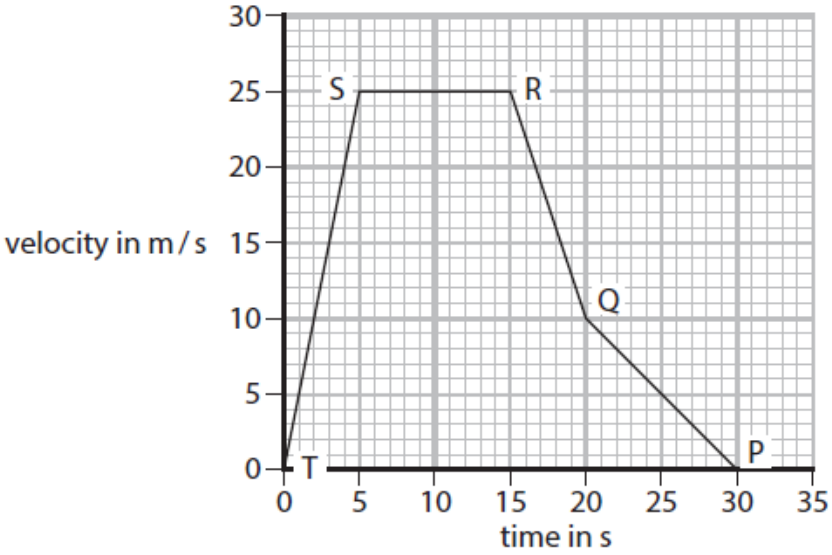


Figure 4

(i) Calculate the acceleration of the car in Figure 4 in the first 5 s.

Use the equation

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

(2)

acceleration = ... m/s^2

(ii) Calculate the distance travelled by the car in Figure 4 from 5 s to 15 s.

(2)

distance = ... m

(Total for question = 4 marks)

(**QU02b 1SC0/1PF, June 2025**)

Q18.

Figure 5 is a velocity/time graph for a lift moving upwards in a tall building.

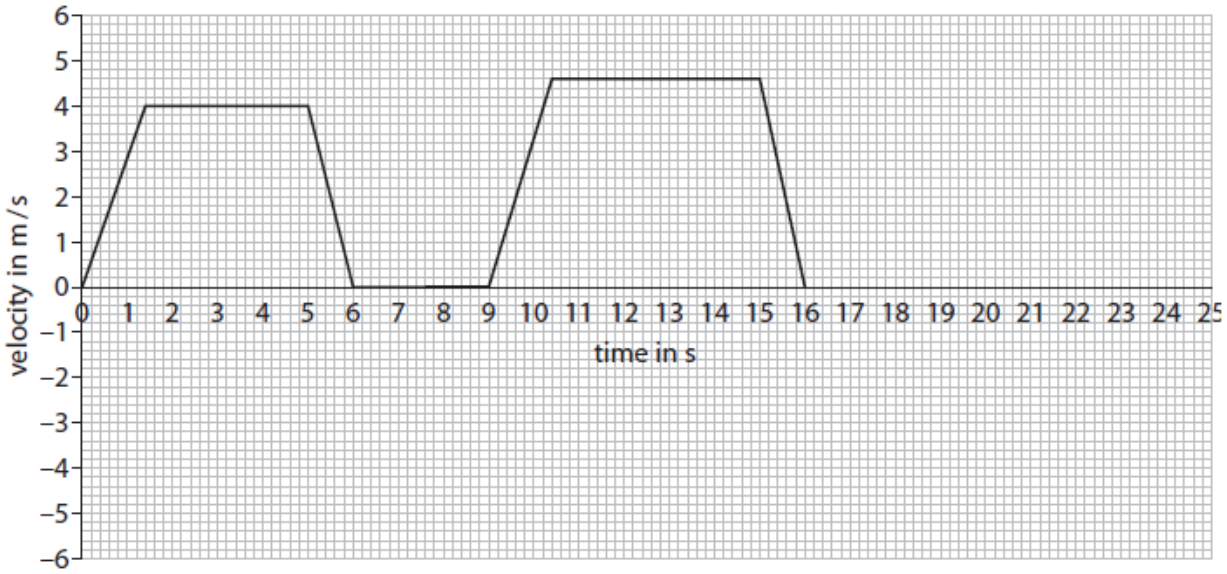


Figure 5

Use the graph in Figure 5 to determine the acceleration of the lift during the first 1.4 s.

(3)

acceleration = ... m/s^2

(Total for question = 3 marks)

(**QU03c 1SC0/1PH, June 2023**)

Q19.

Figure 7 is a velocity/time graph showing a 34 s part of a train's journey.

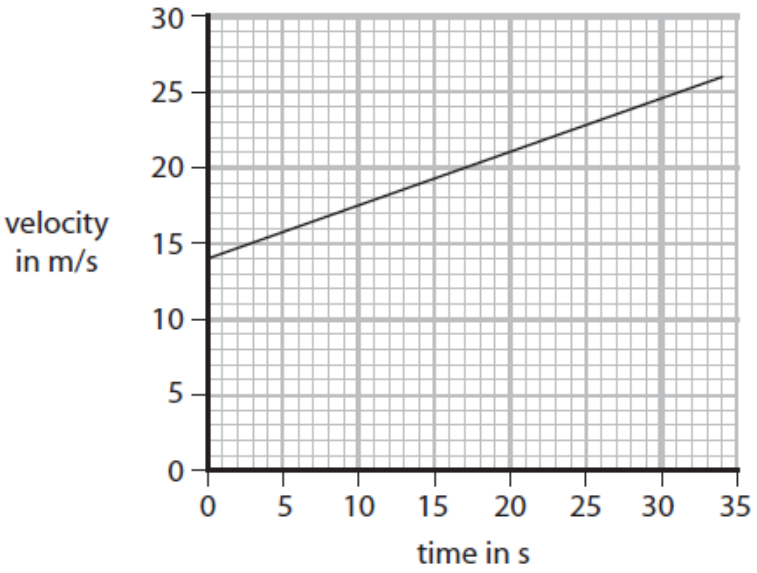


Figure 7

(i) Calculate the acceleration of the train in the 34 s.

Give your answer to an appropriate number of significant figures.

(3)

acceleration = ... m/s^2

(ii) Calculate the distance the train travels in the 34 s.

(3)

distance ..... m

(Total for question = 6 marks)

(**Q04b 1SC0/1PH, Nov 2021**)

Q20.

Figure 5 shows a racket and a tennis ball.

The tennis ball is travelling towards the racket at a velocity of 8.2 m/s.

The ball is hit back in the opposite direction at a velocity of 15 m/s.

The ball has a mass of 0.075 kg.

The ball is in contact with the racket for 12 ms.

(i) Calculate the average force exerted by the ball on the racket.

Use the equation

$$F = \frac{mv - mu}{t}$$

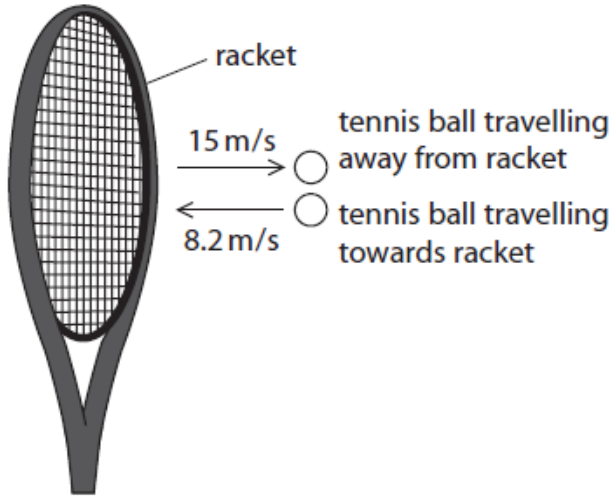


Figure 5

(3)

force = ... N

(ii) Describe how Newton's Third Law of Motion applies to the collision between the racket and the ball.

(2)

.....

.....

.....

.....

(Total for question = 5 marks)

(**QU04c 1SC0/1PH, June 2022**)

Q21.

Another cyclist travels 1200 m in a time of 80 s.

Calculate the average speed of the cyclist.

Use the equation

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

(2)

average speed = ... m / s

(Total for question = 2 marks)

(**Q02b 1SC0/1PF, Nov 2020**)

Q22.

A car travels along a straight road.

The car accelerates at 3 m / s^2 for a time of 7 s.

Calculate the change in velocity of the car.

Use the equation

change in velocity = acceleration × time taken

(2)

change in velocity = ... m / s

(Total for question = 2 marks)

(**QU05c 1SC0/1PF, June 2023**)

Q23.

Figure 9 shows a skier on a slope.

The skier travels down the slope with a constant acceleration.

The speed of the skier is measured at points P and Q.

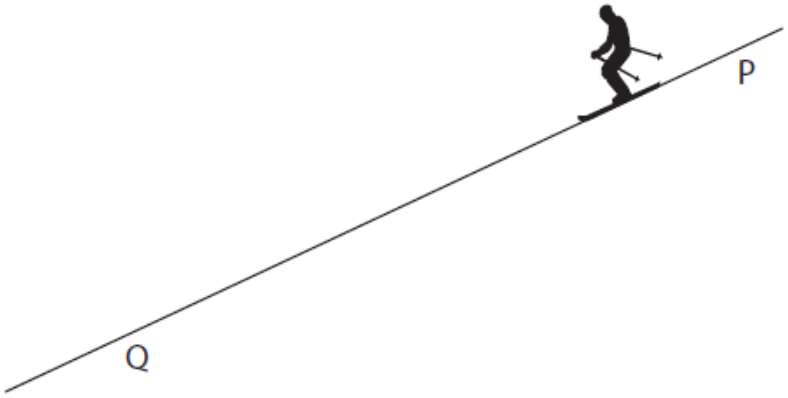


Figure 9

The table in Figure 10 gives some data about the skier making one downhill run.

acceleration	3.0 m/s^2
speed at P	7.6 m/s
speed at Q	24 m/s

Figure 10

(i) Calculate the distance from P to Q.

Use an equation selected from the list of equations at the end of this paper.

(3)

distance from P to Q = ... m

(ii) Calculate the time taken for the skier to travel from P to Q.

(3)

time from P to Q =..... s

(Total for question = 6 marks)

(**Q05c 1SC0/1PH, June 2019**)

Q24.

Figure 5 is a velocity/time graph for a lift moving upwards in a tall building.

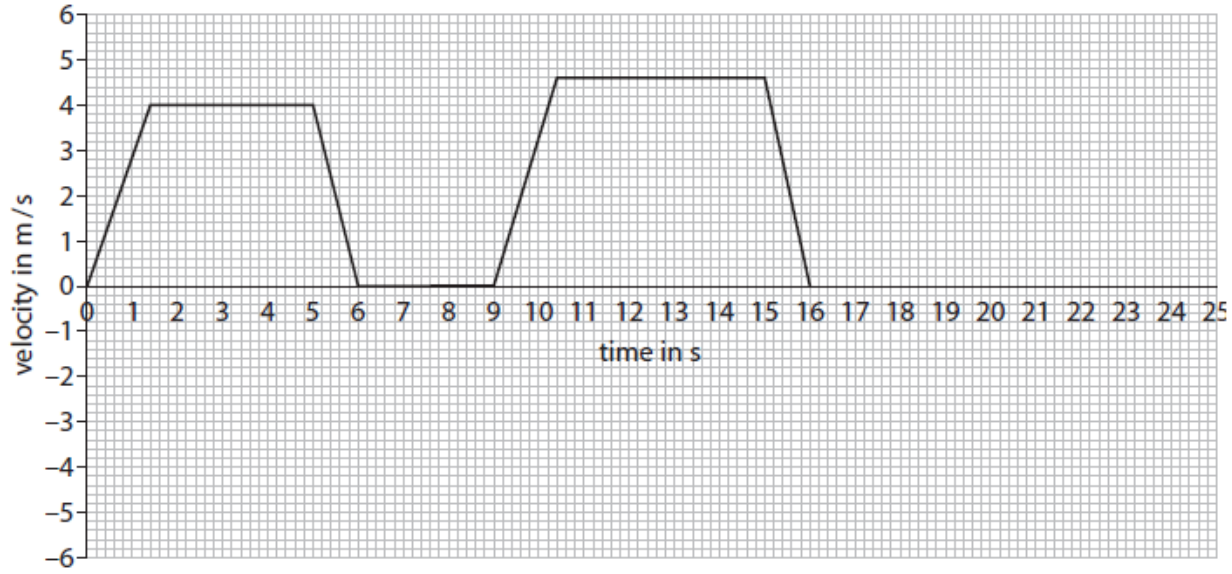


Figure 5

Use the graph in Figure 5 to determine the distance that the lift travelled during the first 6.0 s.

(3)

distance = ... m

(Total for question = 3 marks)

(**QU03d 1SC0/1PH, June 2023**)

Q25.

An aircraft waits at the start of a runway.
The aircraft accelerates from a speed of 0 m/s to a speed of 80 m/s.
The acceleration of the aircraft is 4 m/s^2.

Calculate the distance, x, travelled by the aircraft while it is accelerating.

Use the equation

$$x = \frac{v^2 - u^2}{2a}$$

(2)

x = ... m

(Total for question = 2 marks)

(**Q04b 1SC0/1PF, June 2019**)

Q26.

Figure 11 shows a ball before and after it collides with a wall.

The arrows show the direction of movement of the ball.

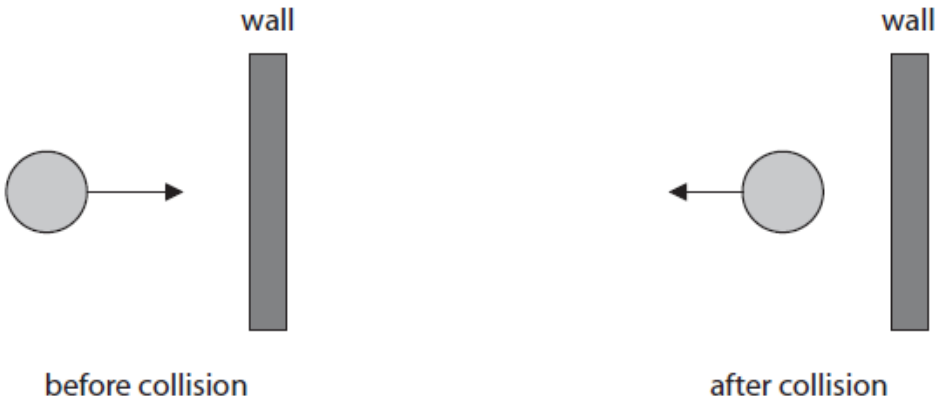


Figure 11

Before the collision, the momentum of the ball is 0.80 kg m / s.

After the collision, the momentum of the ball is 0.60 kg m / s in the opposite direction.

The ball is in contact with the wall for a time of 70 ms during the collision.

Calculate the force exerted on the ball by the wall.

(3)

Use an equation selected from the list of equations at the end of the paper.

force = ... N

(Total for question = 3 marks)

(**QU06b 1SC0/1PH, June 2023**)

Q27.

A different car has a mass of 1200 kg.

Calculate the force needed to give this car an acceleration of 2.4 m / s^2.

(2)

Use the equation

$$F = m \times a$$

force = ... N

(Total for question = 2 marks)

(**QU02b 1SC0/1PF, June 2023**)

Q28.

A car with a mass of 1800 kg is accelerating at 1.2 m/s^2.

Calculate the force used to accelerate the car.

Use the equation

force = mass × acceleration

(2)

force = ... N

(Total for question = 2 marks)

(**Q01b 1SC0/1PF, June 2019**)

Q29.

Figure 7 shows a skier sliding down a slope.

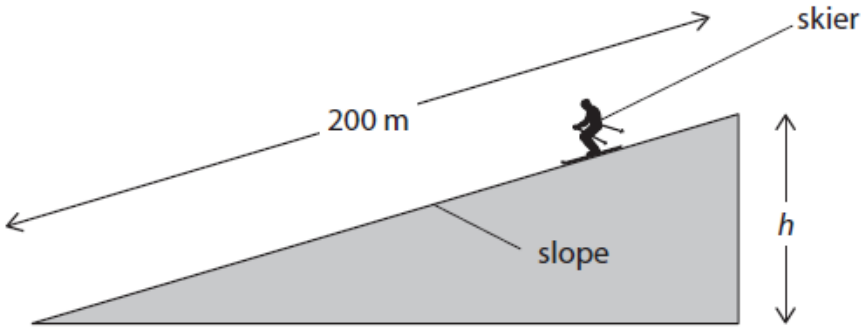


Figure 7

(i) The gravitational potential energy of the skier decreases by 39 000 J between the top and the bottom of the slope.

The mass of the skier is 70 kg.

Calculate the height, *h*, of the slope.

The value of g is 10 N / kg.

Use the equation

$$\Delta GPE = m \times g \times h$$

(2)

h = ... m

(ii) The skier starts from rest at the top of the slope.

The velocity of the skier at the bottom of the slope is 27 m/s.

Using information from Figure 7, calculate the acceleration of the skier along the slope.

(3)

acceleration = ... m/s^2

(iii) When the skier slides from the top to the bottom of the slope, some energy is dissipated.

Explain how to determine the amount of energy dissipated.

(2)

.....

.....

.....

.....

(Total for question = 7 marks)

(**QU04a 1SC0/1PH, June 2025**)

Q30.

The **inertial** mass of an object is a measure of how difficult it is to change the velocity of the object.

A force of 450 N acts on a car to give the car an acceleration of 0.35 m/s^2.

Calculate the **inertial** mass of the car.

(2)

inertial mass of car ..... kg

(Total for question = 2 marks)

(**QU04b 1SC0/1PH, June 2024**)

Q31.

A car accelerates at a constant rate of 1.83 m/s^2 along a flat straight road.

The force acting on the car is 1.870 kN.

Calculate the mass of the car.

Give your answer to three significant figures.

(3)

mass = ... kg

(Total for question = 3 marks)

(**Q06a 1SC0/1PF, SAM 2016**)

Q32.

Figure 11 shows a ball held in a clamp at **R**, above the ground.

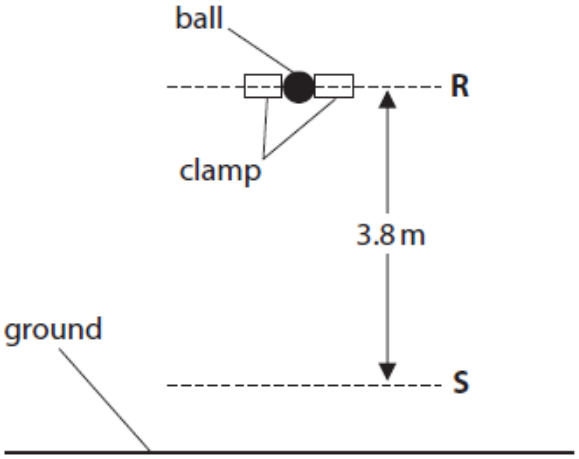


Figure 11

The ball is released from the clamp and falls.

S is 3.8 m below **R**.

At **S** the momentum of the ball is 0.40 kg m/s.

Calculate the mass of the ball.

Acceleration due to gravity, g, = 10 m / s^2

(4)

mass of the ball ..... kg

(Total for question = 4 marks)

(**Q05d 1SC0/1PH, Nov 2021**)

Q33.

Some students are investigating forces.

They use a newton meter to keep a trolley stationary on a sloping runway, as shown in Figure

10.

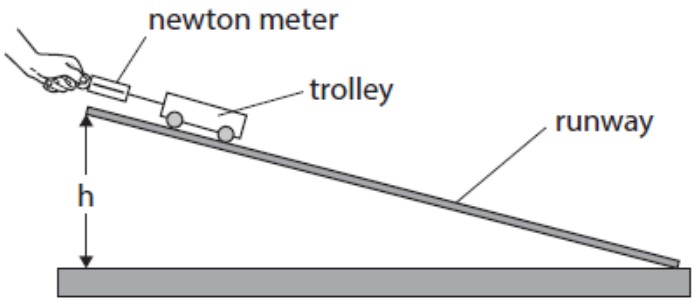


Figure 10

They measure the force needed to keep the trolley stationary on the sloping runway.

(i) They do this at four different places on the runway.

When the height, h, of the runway is 0.60 m, their four readings for force are

2.1 N 2.7 N 2.5 N 2.2 N

Calculate the mean value of these forces.

(1)

mean force = ... N

The students then measure values of the force, F, for several different values of h, the height of the runway.

Figure 11 is a graph of F against h.

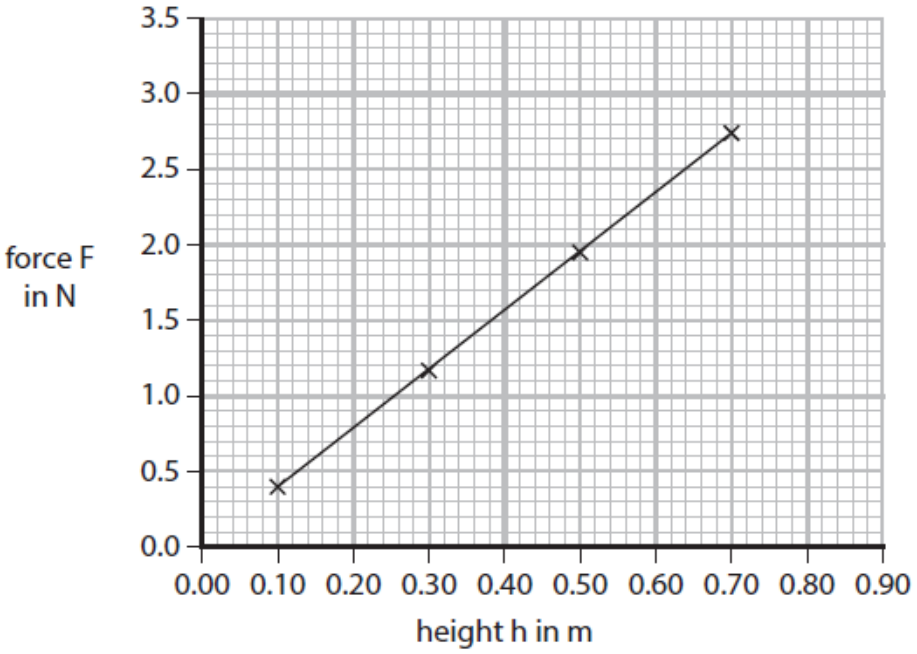


Figure 11

(ii) Use the graph in Figure 11 to determine the value of F when h = 0.80 m.

(2)

F = ... N

(iii) Determine the gradient of the graph in Figure 11.

(2)

gradient = ... N/m

(Total for question = 5 marks)

(**QU05c 1SC0/1PF, June 2025**)

Q34.

Some students are investigating forces.

They use a newton meter to keep a trolley stationary on a sloping runway, as shown in Figure 2.

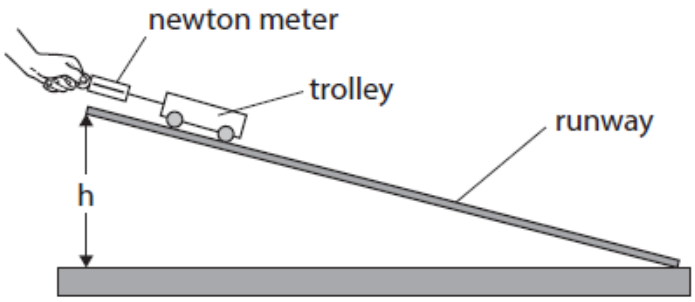


Figure 2

They measure the force needed to keep the trolley stationary on the sloping runway.

(i) They do this at four different places on the runway.

When the height, h, of the runway is 0.60 m, their four readings for force are

2.1 N 2.7 N 2.5 N 2.2 N

Calculate the mean value of these forces.

(1)

mean force = ... N

The students then measure values of the force, F, for several different values of h, the height of the runway.

Figure 3 is a graph of F against h.

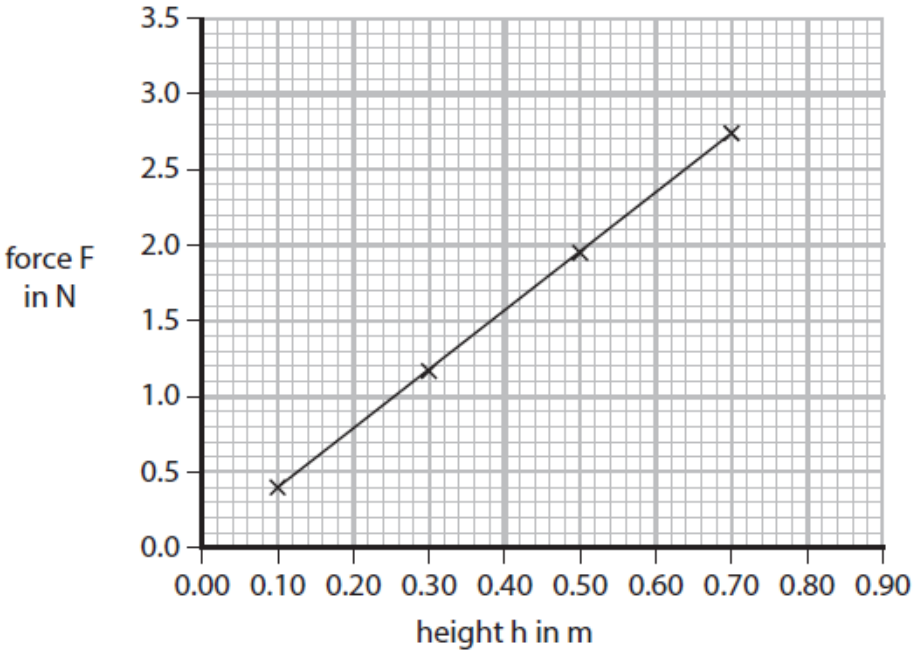


Figure 3

(ii) Use the graph in Figure 3 to determine the value of F when h = 0.80 m.

(2)

F = ... N

(iii) Determine the gradient of the graph in Figure 3.

(2)

gradient = ... N/m

(Total for question = 5 marks)

(**QU01b 1SC0/1PH, June 2025**)

Q35.

An atom of mass 6.6×10^{-26} kg is moving with a velocity of 480 m / s.

Calculate the momentum of the atom.

(3)

momentum = ... kg m/s

(Total for question = 3 marks)

(**QU06a 1SC0/1PH, June 2023**)

Q36.

A car accelerates at a constant rate of 1.83 m/s^2 along a flat straight road.

The force acting on the car is 1.870 kN.

The car accelerates from rest for 16 s.

Calculate the speed of the car after 16 s.

(3)

speed = ... m/s

(Total for question = 3 marks)

(**Q06b 1SC0/1PF, SAM 2016**)

Q37.

A motorcycle is travelling at a velocity of 6.2 m/s.

The motorcycle accelerates at 2.5 m/s^2 until its velocity is 10 m/s.

(i) Calculate the time taken for this acceleration.

Use the equation

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

(2)

time taken = ... s

(ii) The motorcycle now decelerates (slows down) from 10 m/s to a stop.

The deceleration is at a constant rate of 4.4 m/s^2 .

Calculate the distance the motorcycle travels as it slows down to a stop.

Use the equation

$$v^2 - u^2 = 2 \times a \times x$$

distance = ... m

(Total for question = 2 marks)

(**QU06b 1SC0/1PF, June 2024**)

Q38.

A motorcycle is travelling at a velocity of 6.2 m/s.

The motorcycle accelerates at 2.5 m/s^2 until its velocity is 10 m/s.

(i) Calculate the time taken for this acceleration.

Use the equation

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

(2)

time taken = ... s

(ii) The motor cycle now decelerates (slows down) from 10 m/s to a stop.

The deceleration is at a constant rate of 4.4 m/s^2.

Calculate the distance the motorcycle travels as it slows down to a stop.

Use the equation

$$v^2 - u^2 = 2 \times a \times x$$

(2)

distance = ... m

(Total for question = 4 marks)

(**QU02b 1SC0/1PH, June 2024**)

Q39.

Figure 9 shows a small steel ball held at a height, *h*, above the ground.

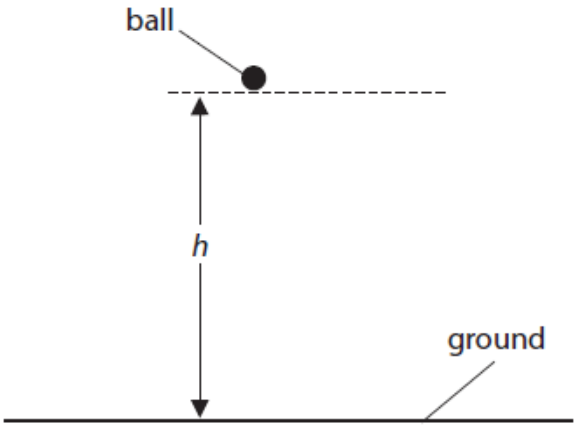


Figure 9

The ball is released and allowed to fall to the ground.

The height *h* is 1.4 m.

Calculate the time, *t*, for the ball to reach the ground.

Use the equation

$$t^2 = \frac{2h}{g}$$

g = 10 m/s^2

(2)

t = ... s

(Total for question = 2 marks)

(**Q05a 1SC0/1PH, Nov 2021**)

Q40.

Figure 8 shows a gymnast landing on a mat and coming to rest.

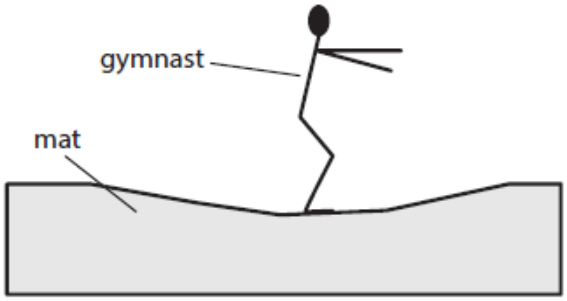


Figure 8

The gymnast has a mass of 53 kg.

The gymnast lands on the mat with a velocity of 4.0 m/s.

The average force exerted by the mat on the gymnast is 3500 N.

Calculate the time taken for the gymnast to come to rest.

Give your answer to an appropriate number of significant figures.

Use the equation

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

(3)

time = ... s

(Total for question = 3 marks)

(**QU06b 1SC0/1PH, June 2024**)