PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

PHYSICS



EXAM QUESTION PACK

TOPIC 8: ENERGY – FORCES DOING WORK (PAPER 2)

SCORE	PERCENTAGE
/164	%

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Q1.

* A class of students investigate the power output of each student in the class.

The class must decide whether they use a method using steps or a method using weights.
The whole class must use the same method.

Plan what measurements the students should take and how these can be used to calculate and compare the power output of each student.

You may draw a diagram to help with your plan.

(6)

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(Total for question = 6 marks)

(**Q23 1SC0/2PF, June 2018**)

Q2.

An athlete uses a training machine in a gym.

The display on the machine shows the time spent on the machine and the amount of energy transferred during a training session.

Figure 5 shows the displays for two different sessions by the same athlete.

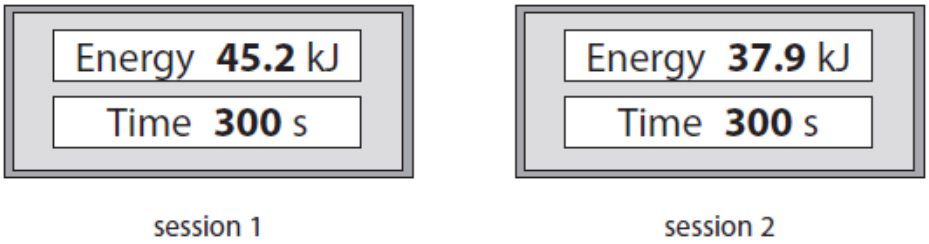


Figure 5

Explain what the displays show about the average power of the athlete in each of these two sessions.

(2)

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(Total for question = 2 marks)

(**Q07 1SC0/2PH, June 2018**)

Q3.

(i) A student heats an aluminium block, as shown in Figure 4.

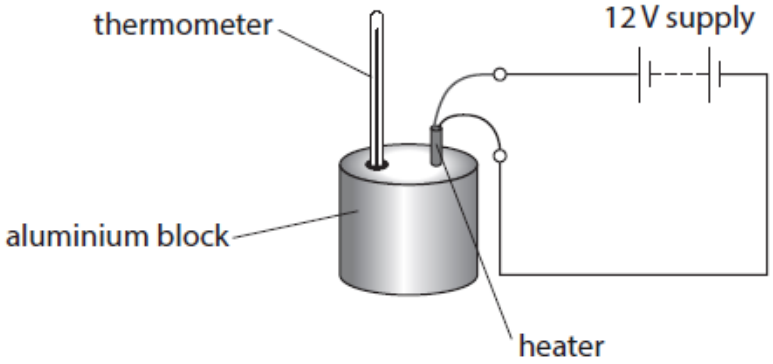


Figure 4

The aluminium block has a mass of 0.96 kg.

The specific heat capacity of aluminium is 920 J/kg °C.

The temperature of the block increases from 18 °C to 35 °C.

Calculate the change in thermal energy of the aluminium block.

Use the equation

change in thermal energy = mass × specific heat capacity × change in temperature

(2)

change in thermal energy = ... J

(ii) Suggest **one** way the student could reduce the energy loss from the aluminium block during the experiment.

(1)

.....

.....

(iii) The thermometer does not show the maximum temperature reached by the aluminium block until some time after the heater is switched off.

Give **one** reason for this.

(1)

.....

.....

(Total for question = 4 marks)

(**QU02c 1SC0/2PF, June 2025**)

Q4.

Three students carry out an investigation to determine their powers when running up stairs.

They take turns to run up the stairs and use a stopwatch to measure the time taken.

The students estimate their own weight.

Figure 8 shows a table of their results.

The table is not complete.

student	student estimate of weight in N	distance in m	work done	time taken in s	power in W
A	550	4.0	2200	5.0	440
B		4.0	1960	4.5	436
C	510	4.0	2040		425

Figure 8

(i) State the unit for work done.

(1)

unit for work done is .....

(ii) Use the data for student B to calculate his estimated weight.

(2)

weight = ... N

(iii) Use the data for student C to calculate the time she takes.

(2)

time taken = ... s

(iv) Use the data for all three students to calculate the average power of the students.

(2)

average power = ... W

(Total for question = 7 marks)

(**QU04b 1SC0/2PF, June 2022**)

Q5.

A cyclist starts to cycle.

The cyclist does 1600 J of useful work to travel 28 m.

Calculate the average force the cyclist exerts.

(3)

average force = ... N

(Total for question = 3 marks)

(**Q22 1SC0/2PF, June 2018**)

Q6.

A cyclist starts to cycle.

The cyclist does 1600 J of useful work to travel 28 m.

Calculate the average force the cyclist exerts.

(3)

average force = ... N

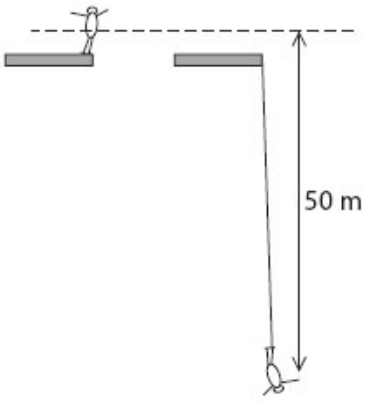
(Total for question = 3 marks)

(**Q06 1SC0/2PH, June 2018**)

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.

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

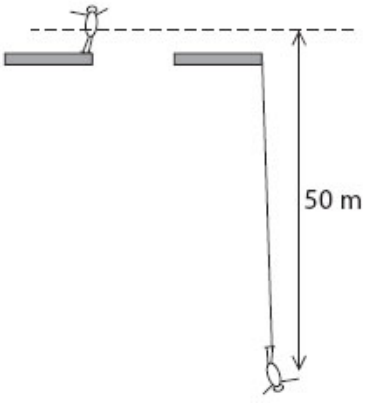
☒ **D** when the elastic potential energy is zero

(**Q14 1SC0/2PF, June 2013**)

Q8.

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)

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.....

.....

(Total for Question = 8 marks)

(**Q12 1SC0/2PF, June 2013**)

Q9.

Figure 13 shows a storage heater.

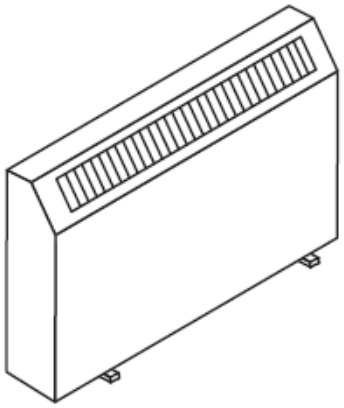


Figure 13

The storage heater contains bricks.

The bricks are heated electrically.

The electrical heater supplies 210 kJ of energy to each brick in the storage heater.

One brick has a mass of 5.8 kg.

The specific heat capacity for the brick is 860 J/kg K.

(i) Use this data to calculate the increase in temperature of the brick.

(2)

temperature increase = ... °C

(ii) The actual temperature increase will be smaller than you calculated in (i).

Explain why the actual temperature increase will be smaller than the value in (i).

(2)

.....

.....

.....

.....

(Total for question = 4 marks)

(**QU06c 1SC0/2PH, June 2024**)

Q10.

This question is about energy changes.

Figure 8 shows a water slide.
A person travels from the top to the bottom of the water slide.

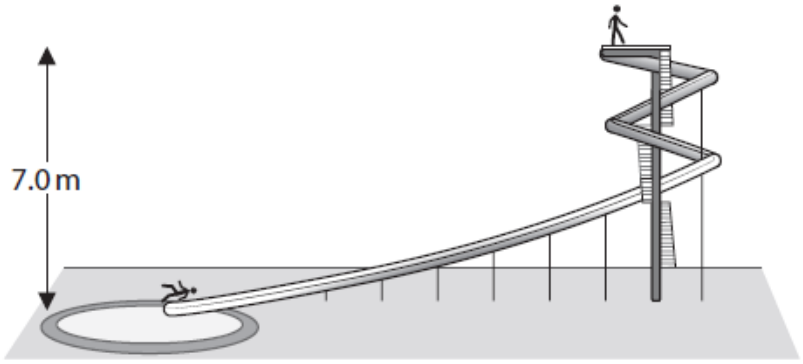


Figure 8

(i) The mass of the person, m = 72 kg.

The change in vertical height, h = 7.0 m
Gravitational field strength, g = 10 N / kg

Calculate the change in gravitational potential energy for the person.

Use the equation

$$\text{change in gravitational potential energy} = m \times g \times h$$

(2)

change in gravitational potential energy = ... J

(ii) The person comes to rest after the end of the water slide.

Explain what happens to the energy as the person comes to rest after the end of the water slide.

(2)

.....

.....

(Total for question = 4 marks)

(**Q04a 1SC0/2PF, Nov 2021**)

Q11.

A rock falls off the top of a cliff of height *h*.

Figure 8 shows the rock falling.

The Earth exerts a force of 150 N on the rock.

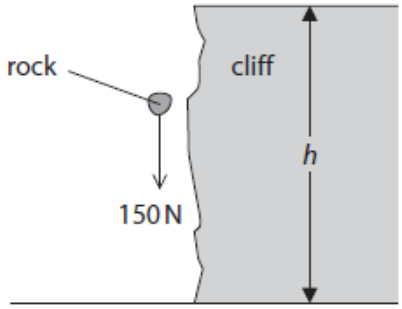


Figure 8

The work done by this force when the rock falls from the top to the bottom of the cliff is 2700 J.

(i) Calculate the height, *h*, of the cliff.

(2)

h = ... m

(ii) State the value of the kinetic energy of the rock just before it hits the ground.

(1)

kinetic energy = ... J

(iii) The mass of the rock in Figure 8 is 15 kg.

Calculate the velocity of the rock just before it reaches the bottom of the cliff.

(2)

velocity = ... m/s

(Total for question = 5 marks)

(**Q05b 1SC0/2PF/S2, SAM**)

Q12.

A rock falls off the top of a cliff of height *h*.

Figure 1 shows the rock falling.

The Earth exerts a force of 150 N on the rock.

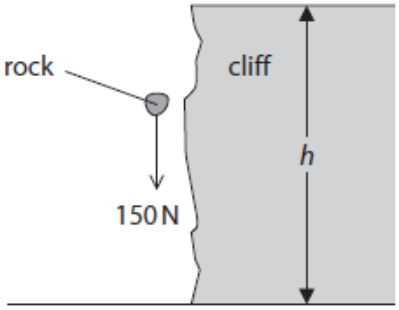


Figure 1

The work done by this force when the rock falls from the top to the bottom of the cliff is 2700 J.

(i) Calculate the height, *h*, of the cliff.

(2)

h = ... m

(ii) State the value of the kinetic energy of the rock just before it hits the ground.

(1)

kinetic energy = ... J

(iii) The mass of the rock in Figure 1 is 15 kg.

Calculate the velocity of the rock just before it reaches the bottom of the cliff.

(2)

velocity = ... m/s

(Total for question = 5 marks)

(**Q01b 1SC0/2PH/S2, SAM**)

Q13.

A ball has a mass of 0.046 kg.

(i) Calculate the change in gravitational potential energy when the ball is lifted through a vertical height of 2.05 m.

Use the equation

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

(2)

change in gravitational potential energy = ... J

(ii) The ball is released.

Calculate the kinetic energy of the ball when the speed of the ball is 3.5 m/s.

(3)

kinetic energy of the ball = ... J

(iii) The ball bounces several times.

Figure 7 shows how the height of the ball above the floor changes with time.

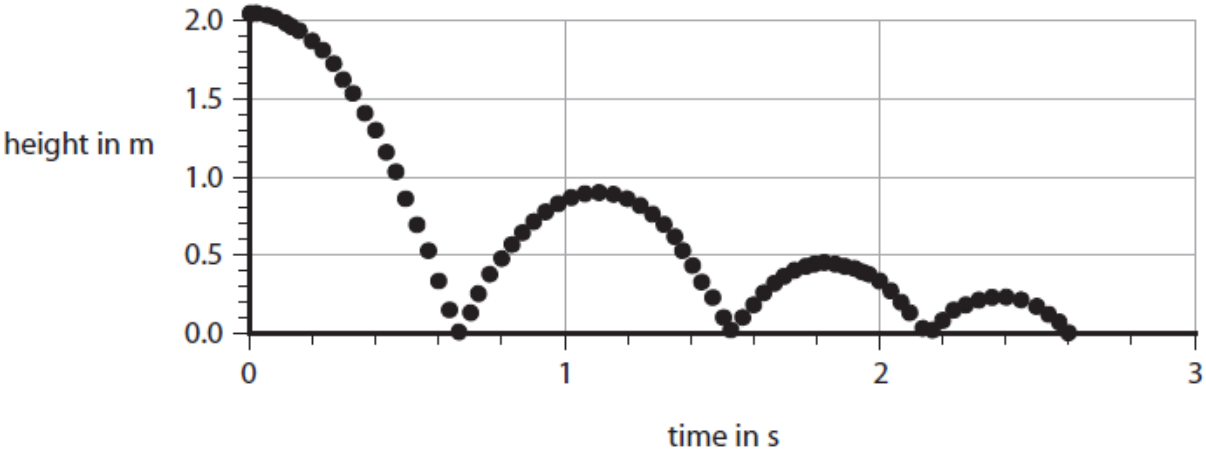


Figure 7

Use Figure 7 to estimate the maximum height that the ball reaches after the first bounce.

(1)

height after first bounce = ... m

(iv) Explain why the ball does not bounce back to its starting height of 2.05 m.

(2)

.....

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.....

.....

(Total for question = 8 marks)

(**Q05b 1SC0/2PF, June 2019**)

Q14.

A ball has a mass of 0.046 kg.

(i) Calculate the change in gravitational potential energy when the ball is lifted through a vertical height of 2.05 m.

Use the equation

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

(2)

change in gravitational potential energy = ... J

(ii) The ball is released.

Calculate the kinetic energy of the ball when the speed of the ball is 3.5 m/s.

(3)

kinetic energy of the ball = ... J

(iii) The ball bounces several times.

Figure 1 shows how the height of the ball above the floor changes with time.

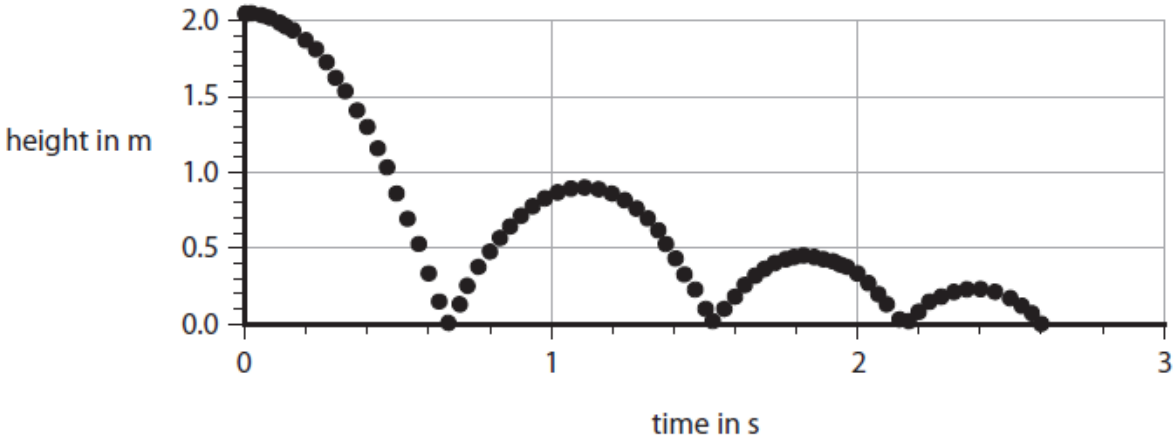


Figure 1

Use Figure 1 to estimate the maximum height that the ball reaches after the first bounce.

(1)

height after first bounce = ... m

(iv) Explain why the ball does not bounce back to its starting height of 2.05 m.

(2)

.....

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(Total for question = 8 marks)

(**Q01b 1SC0/2PH, June 2019**)

Q15.

(i) A different student finds out how much power can be generated by running up some stairs in a measured amount of time.

The following quantities are measured:

mass of student = 48 kg

total height of stairs = 2.9 m

time to run up stairs = 3.4 s

Calculate the power the student generated.

Give the answer to 2 significant figures (2 s.f.).

Use the equation

$$\text{power} = \frac{\text{weight of student} \times \text{height of stairs}}{\text{time to run up stairs}}$$

(3)

power = ... W

(ii) Explain how the total height of the stairs can be found using a 50 cm ruler.

(2)

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(Total for question = 5 marks)

(**QU05b 1SC0/2PF, June 2025**)

Q16.

(i) A different student finds out how much power can be generated by running up some stairs in a measured amount of time.

The following quantities are measured:

mass of student = 48 kg

total height of stairs = 2.9 m

time to run up stairs = 3.4 s

Calculate the power the student generated.

Give the answer to 2 significant figures (2 s.f.).

Use the equation

$$\text{power} = \frac{\text{weight of student} \times \text{height of stairs}}{\text{time to run up stairs}}$$

(3)

power = ... W

(Total for question = 3 marks)

(**QU01b 1SC0/2PH, June 2025**)

Q17.

Figure 6 shows a 'Mars rover' descending to the surface of the planet Mars.

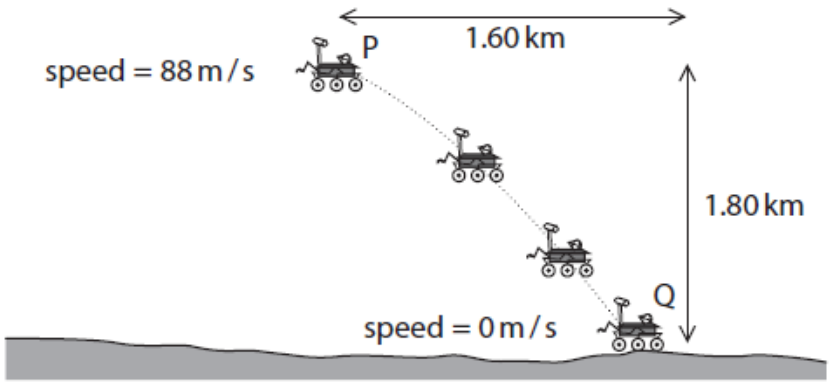


Figure 6

(i) Calculate the change in gravitational potential energy of the rover as it descends from position P to position Q.

Mass of rover = 1100 kg

Gravitational field strength on Mars = 3.7 N / kg

Give your answer to 2 significant figures.

(3)

change in gravitational potential energy = ... J

(ii) Use data from Figure 6 to calculate the change in kinetic energy of the rover as it descends from position P to position Q.

(2)

change in kinetic energy = ... J

(iii) The rover is slowed down safely using thrusters and a parachute (not shown in Figure 6).

The thrusters use jets of gas to control movements and the parachute is designed to be used in the atmosphere of Mars.

Describe the energy changes involved in terms of the work done by various forces as the rover descends.

(3)

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(Total for question = 8 marks)

(**QU04a 1SC0/2PH, June 2022**)

Q18.

Figure 13 shows a drone.



© Liubov Kotliar/123RF

Figure 13

A different drone has a mass of 4.5 kg.

This drone rises from the ground to a height of 20 m.

(i) Calculate the change in gravitational potential energy when the drone rises through a height of 20 m.

The gravitational field strength g = 10 N/kg.

(2)

change in gravitational potential energy = ... J

(ii) State the amount of useful work done by the blades as the drone rises through 20 m.

(1)

useful work done = ... J

(iii) It takes 4 s for the drone to rise through 20 m.

Calculate the useful power developed by the blades in this time of 4 s.

(2)

useful power developed = ... W

(Total for question = 5 marks)

(**Q06b 1SC0/2PF, Nov 2020**)

Q19.

Figure 4 shows a drone.



© Liubov Kotliar/123RF

Figure 4

A different drone has a mass of 4.5 kg.

This drone rises from the ground to a height of 20 m.

(i) Calculate the change in gravitational potential energy when the drone rises through a height of 20 m.

The gravitational field strength g = 10 N/kg.

(2)

change in gravitational potential energy = ... J

(ii) State the amount of useful work done by the blades as the drone rises through 20 m.

(1)

useful work done = ... J

(iii) It takes 4 s for the drone to rise through 20 m.

Calculate the useful power developed by the blades in this time of 4 s.

(2)

useful power developed = ... W

(Total for question = 5 marks)

(**Q02b 1SC0/2PH, Nov 2020**)

Q20.

This question is about energy transfers.

Figure 8 shows the apparatus used for investigating the transfer between gravitational potential energy and kinetic energy.

A metal ball is attached to a thread.

The ball is released from a starting position and swings on the thread.

The ball cuts a light beam at the bottom of its swing.

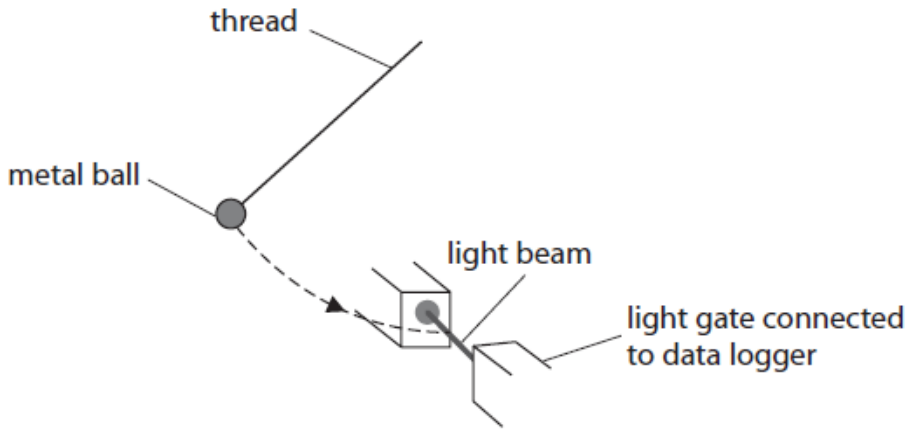


Figure 8

When the ball cuts the light beam, the speed of the ball is recorded by the data logger.

The ball was released 3 times from the same height and the speed measured each time.

The measurements of speed are given in Figure 9.

speed in m/s	1.31	1.27	1.16

Figure 9

The mass of the ball is 0.052 kg.

The ball falls through a vertical height (Δh) of 5.0 cm as it swings.

The gravitational field strength, g, is 10 N/kg.

Calculate the change in the gravitational potential energy of the ball.

Use the equation

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

(3)

change in gravitational potential energy = ... J

(Total for question = 3 marks)

(**QU04c 1SC0/2PF, June 2023**)

Q21.

This question is about using the mains electricity supply.

(i) An electric kettle is used to boil some water.

The mains supply voltage is 230 V.
The power supplied to the kettle is 1.9 kW.

Calculate the current in the kettle.
Use the equation

$$I = \frac{P}{V}$$

(2)

current supplied to the kettle = ... A

(ii) A coffee machine takes 120 s to heat some water.

Mains supply voltage = 230 V
Current in this coffee machine = 7.4 A

Calculate the energy transferred to the coffee machine in 120 s.

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

(2)

energy transferred to coffee machine = ... J

(Total for question = 4 marks)

(**Q03a 1SC0/2PF, Nov 2021**)

Q22.

Figure 8 shows an athlete training with a push sled.

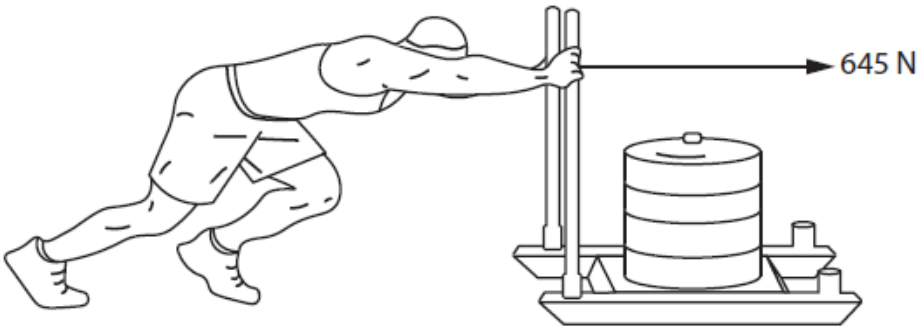


Figure 8

The athlete pushes the sled with a force of 645 N.

Calculate the distance the sled moves when the force of 645 N does 7440 J of work on the sled.

Give your answer to an appropriate number of significant figures.

(3)

distance moved = ... m

(Total for question = 3 marks)

(**QU04a 1SC0/2PH, June 2024**)

Q23.

Calculate the kinetic energy of a tennis ball travelling at 28 m/s.
The mass of the tennis ball = 58 g.

Use the equation

$$KE = \frac{1}{2} \times m \times v^2$$

(3)

kinetic energy = ... J

(Total for question = 3 marks)

(**Q04c 1SC0/2PF, Nov 2021**)

Q24.

An electric car is travelling at a speed of 16.0 m/s.

The total mass of the car is 1200 kg.

(i) Calculate the kinetic energy, in kJ, of the car.

(2)

kinetic energy = ... kJ

(ii) On a journey, the car transfers energy from the battery at an average rate of 17.5 kW.

The battery in the car transfers a total of 126 MJ of energy before it becomes discharged.

Calculate the time taken for the battery to become discharged on this journey.

Give your answer in hours.

(2)

time taken = ... hours

(iii) Figure 10 shows an electrical device connected to the wheels of an electric car.

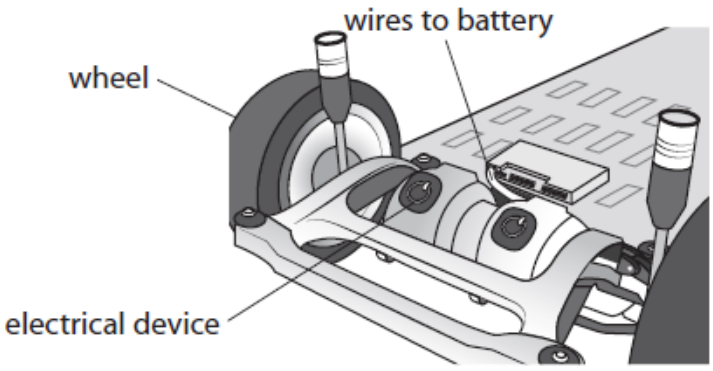


Figure 10

The electrical device is used as a motor when the car accelerates and as a dynamo when the car decelerates.

Explain how using the device can help to increase the time that the car can be driven before the battery becomes discharged.

(2)

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.....

.....

.....

(Total for question = 6 marks)

(**QU05a 1SC0/2PH, June 2023**)

Q25.

This question is about energy transfers.

Figure 8 shows the apparatus used for investigating the transfer between gravitational potential energy and kinetic energy.

A metal ball is attached to a thread.

The ball is released from a starting position and swings on the thread.

The ball cuts a light beam at the bottom of its swing.

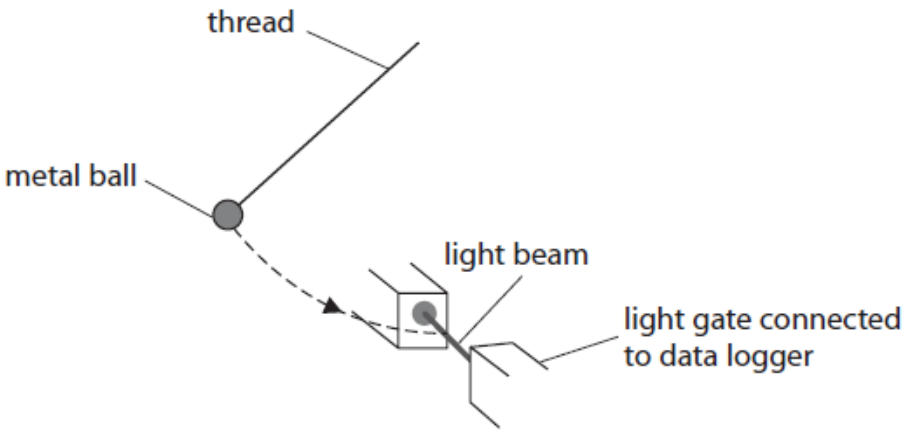


Figure 8

When the ball cuts the light beam, the speed of the ball is recorded by the data logger.

The ball was released 3 times from the same height and the speed measured each time.

The measurements of speed are given in Figure 9.

speed in m/s	1.31	1.27	1.16

Figure 9

Calculate the mean speed.

(2)

mean speed = ... m/s

(Total for question = 2 marks)

(**QU04a 1SC0/2PF, June 2023**)

Q26.

Figure 8 shows a saucepan of milk being heated on an electric cooker.



© Por Fabian Ponce Garcia/Shutterstock

Figure 8

The cooker supplies 130 000 J of energy in a time of 87 s.

(i) Calculate the power supplied by the cooker.

Use the equation

$$P = \frac{E}{t}$$

Give your answer to 2 significant figures.

(3)

power = ... W

(ii) The cooker supplies 130 000 J of energy but only 96 000 J of this energy is used to heat the milk.

Calculate the efficiency of heating the milk using this cooker.

Use the equation

$$\text{efficiency} = \frac{\text{useful energy transferred}}{\text{total energy supplied}}$$

(2)

efficiency = ...

(Total for question = 5 marks)

(**QU04b 1SC0/2PF, June 2024**)

Q27.

Figure 7 shows an athlete using a fitness device.

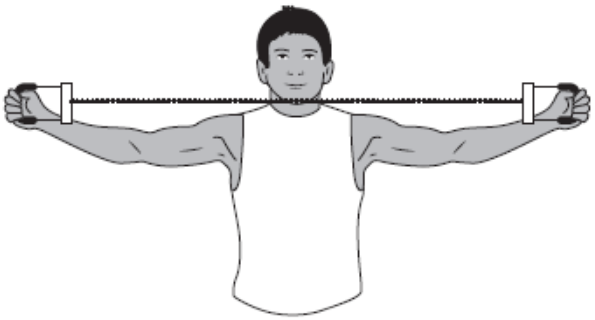


Figure 7

The athlete stretches the spring in the device by pulling the handles apart.

The spring constant of the spring is 140 N/m.

The athlete does 45 J of work to extend the spring.

The athlete takes 0.6 s to expand the spring.

(i) Calculate the useful power output of the athlete when stretching the spring.

(2)

useful power output of the athlete = ... W

(ii) Calculate the extension of the spring.

Use an equation selected from the list of equations from the relevant equation sheet.

(3)

extension of the spring = ... m

(Total for question = 5 marks)

(**Q05a 1SC0/2PH, June 2019**)

Q28.

The kinetic energy of another cyclist is 2800 J.

The mass of the cyclist is 85 kg.

Calculate the velocity of this cyclist.

Use the equation

$$KE = \frac{1}{2} \times m \times v^2$$

(3)

velocity = ... m/s

(Total for question = 3 marks)

(**Q04b 1SC0/2PH, Nov 2021**)

Q29.

Figure 5 shows a truck on a horizontal road.

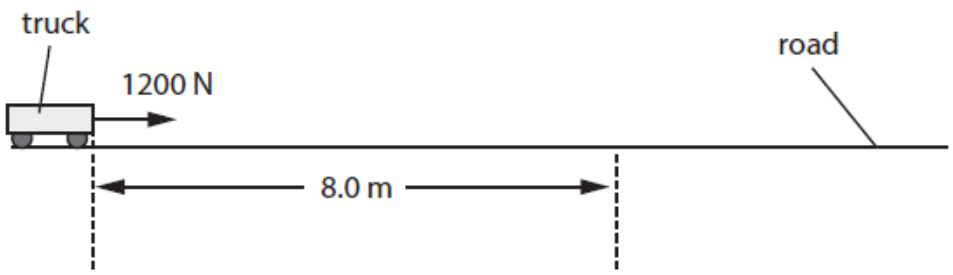


Figure 5

(i) A force of 1200 N pulls the truck along the road for a distance of 8.0 m.

Calculate the work done by the 1200 N force.

Use the equation

work done = force × distance moved in the direction of the force

State the unit of work done.

(3)

work done = ...

unit .....

(ii) At 8.0 m the force is removed and the truck slows down until it stops.

Describe the energy transfers as the truck slows down.

(2)

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(Total for question = 5 marks)

(**QU03a 1SC0/2PF, June 2024**)

Q30.

Figure 3 shows a toy used to launch a ball.

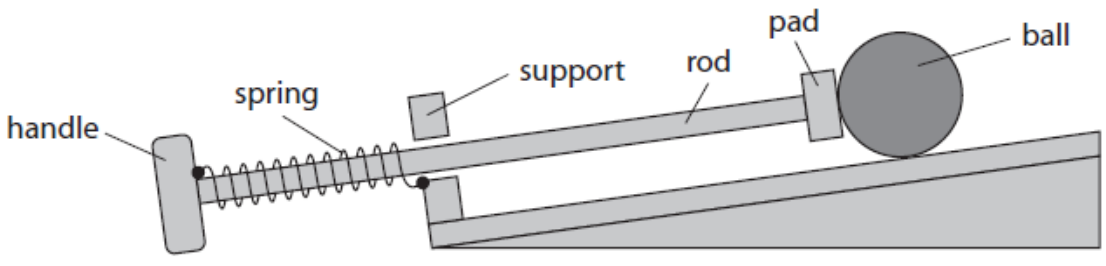


Figure 3

One end of the spring is fixed to the handle.

The other end of the spring is fixed to the support.

The child pulls the handle until the pad is against the support as shown in Figure 5.

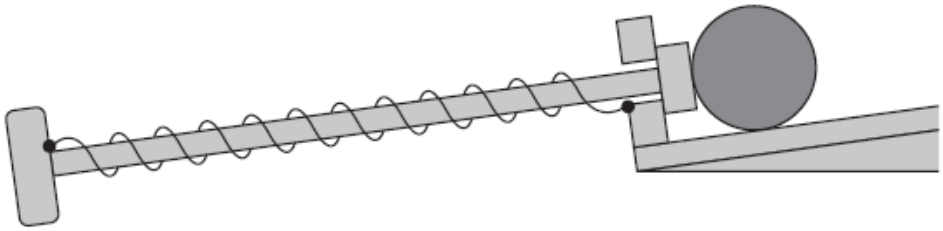


Figure 5

(i) The extension of the spring is 0.09 m.

The spring constant (k) is 20 N/m.

Calculate the work done in extending the spring by 0.09 m.

Use the equation

$$\text{work done} = \tfrac{1}{2} \times k \times (\text{extension})^2$$

(2)

work done = ... J

(ii) The child lets go of the handle.

The ball starts to move.

The spring returns to its original length.

Describe the energy transfer that takes place when the ball starts to move.

(2)

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(iii) The child can only stretch the spring until the pad is pressing against the support.

Explain how the design of the toy prevents the spring from becoming damaged.

(2)

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(Total for question = 6 marks)

(Q02b 1SC0/2PF, Nov 2020)

Q31.

Figure 11 shows a pulley system that enables a person to lift a heavy barrel.

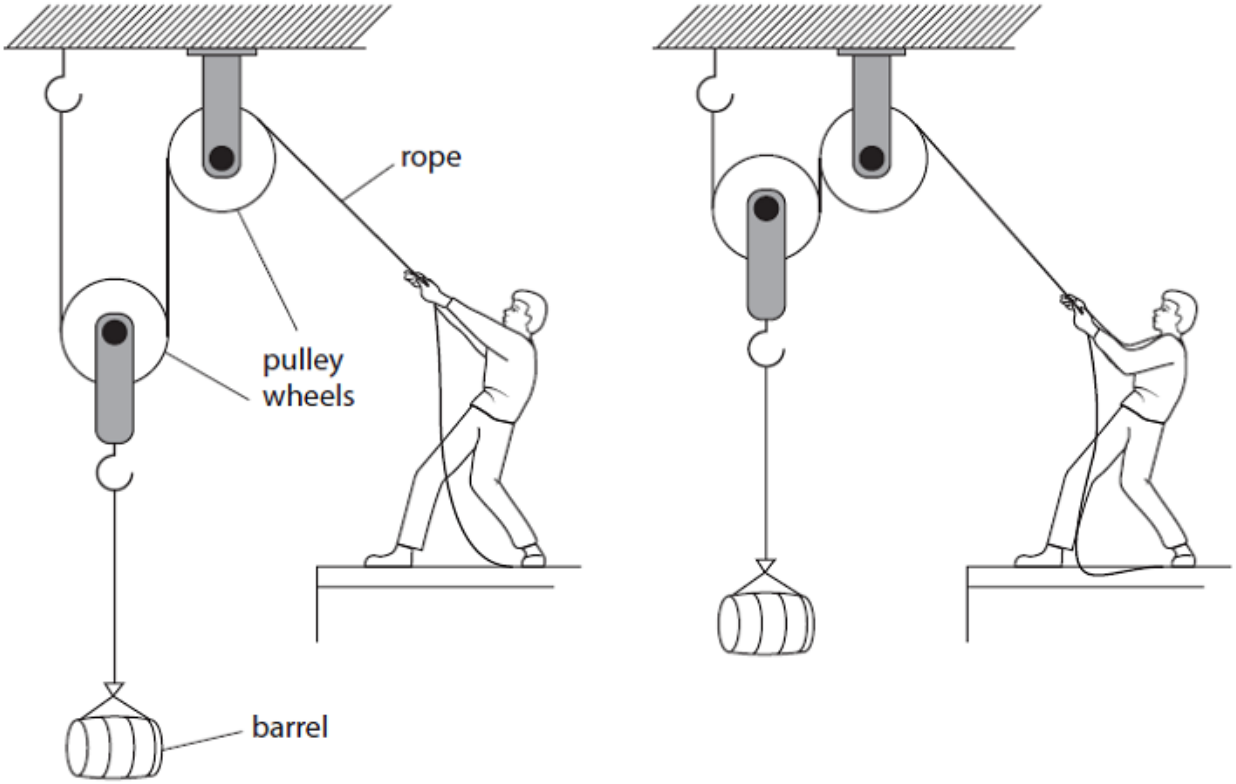


Figure 11

The person pulls down on the rope to make the barrel rise through 1.2 m.

The work done against gravity on the barrel is 1800 J.

(i) Calculate the weight of the barrel.

Use the equation

work done = force × distance moved in the direction of the force

(2)

weight of the barrel = ... N

(ii) The efficiency of the system is 64%.

Calculate the total work done by the person.

Use the equation

$$\text{efficiency} = \frac{\text{(work done against gravity on the barrel)}}{\text{(total work done by the person)}} \times 100\%$$

(2)

work done = ... J

(iii) Some energy is wasted due to friction.

Suggest **another** reason why some energy is wasted in using this pulley system.

(1)

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.....

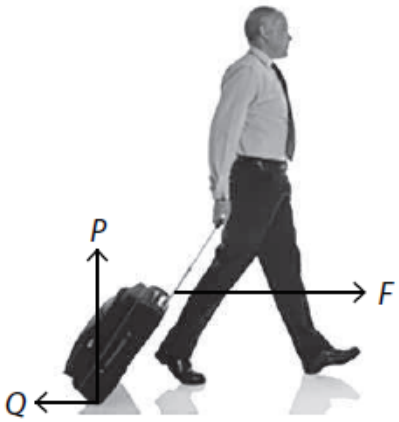
(Total for question = 5 marks)

(**QU06a 1SC0/2PH, June 2023**)

Q32.

A man pulls a suitcase with a horizontal force, *F*, as shown in Figure 10.

Two other forces acting on the suitcase are labelled *P* and *Q*.



Not to scale

Figure 10

(a) The man pulls the suitcase for 80 m along a horizontal path.

The mass of the man and the suitcase is 85 kg.

The man does 1200 J of work on the suitcase as he pulls the suitcase along.

He walks with an average velocity of 1.5 m/ s.

(i) Calculate the kinetic energy of the man and the suitcase.

(2)

kinetic energy = ... J

(ii) Calculate the horizontal force, *F*, that the man exerts on the suitcase.

Use the equation:

work done = force × distance moved in the direction of the force

(2)

force = ... N

(b) The man runs up a set of stairs carrying his suitcase.

Explain whether he does more total work if he walks up the same stairs instead of running.

(2)

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.....

(c) The man lifts his suitcase.

The increase in gravitational potential energy of the suitcase is 264 J.

The mass of the suitcase is 12 kg.

Calculate the vertical height the suitcase is raised.

(gravitational field strength, g = 10 N/kg)

Use the equation:

change in gravitational potential energy = mass × g × change in vertical height

(2)

height raised = ... m

(Total for question = 4 marks)

(Q03bcd 1SC0/2PF, SAM 2016)

Q33.

Figure 1 shows part of a roller coaster ride seen from the side.

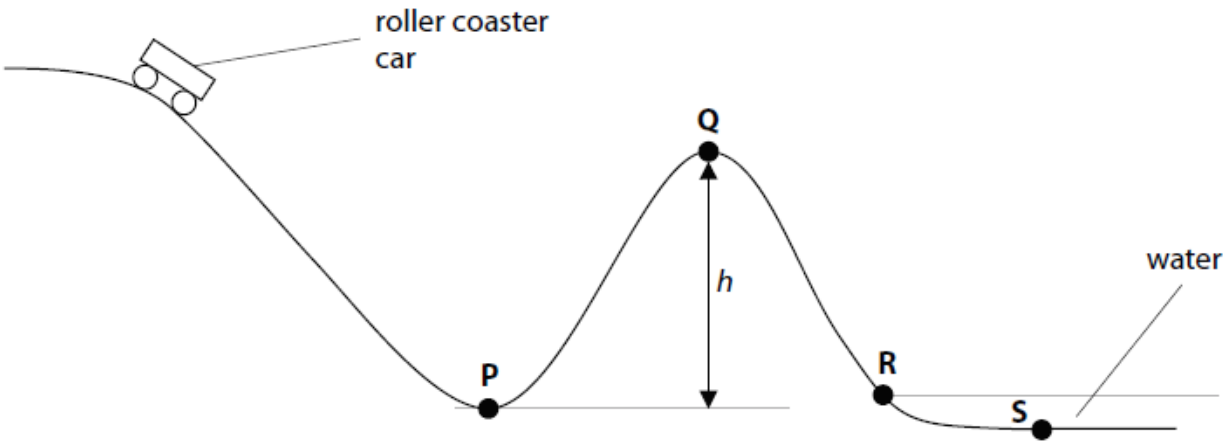


Figure 1

(a) The roller coaster car rolls down towards **P**. The car has mass, *m* kg and velocity *v* m/s.

Which of these is the correct equation for calculating the kinetic energy of the car?

(1)

☒ **A** $KE = mv$

☒ **B** $KE = mv^2$

☒ **C** $KE = ½mv^2$

☒ **D** $KE = 2mv^2$

(b) The mass of the car is 580 kg.

The car gains 39 000 J of gravitational potential energy as it climbs from **P** to **Q**.

(i) State the equation relating change in gravitational potential energy, mass, gravitational field strength and change in vertical height.

(1)

(ii) Calculate the height *h*, shown in Figure 1.

(gravitational field strength, g = 10 N/kg)

(3)

h = ... m

(Total for question = 5 marks)

(**Q01ab 1SC0/2PH, SAM 2016**)

Q34.

A cyclist is riding a bicycle at a steady velocity of 12 m/s.

The cyclist and bicycle have a total mass of 68 kg.

Calculate the kinetic energy of the cyclist and bicycle.

Use the equation

$$KE = \frac{1}{2} \times m \times v^2$$

(2)

kinetic energy = ... J

(Total for question = 2 marks)

(**Q20 1SC0/2PF, June 2018**)

Q35.

A cyclist is riding a bicycle at a steady velocity of 12 m/s.

The cyclist and bicycle have a total mass of 68 kg.

Calculate the kinetic energy of the cyclist and bicycle.

Use the equation

$$KE = \frac{1}{2} \times m \times v^2$$

(2)

kinetic energy = ... J

(Total for question = 2 marks)

(**Q04 1SC0/2PH, June 2018**)

Q36.

The photograph shows a man dropping an egg inside a padded box from a height.



He is investigating to see if the padding stops the egg from breaking.

The weight of the egg is 0.6 N.

Calculate the work done on the egg to lift it up by 20 m. State the unit.

(3)

work done on egg = ...unit ..... .

(**Q05 1SC0/2PF, June 2013**)

Q37.

The espresso machine shown in Figure 27 is an electrical appliance.



(Source: © tanawaty/123RF)

Figure 27

The espresso machine has a steam pipe that can be used to heat milk in a jug, as shown in Figure 28.



(Source: © Wavebreak Media Ltd/123RF)

Figure 28

Steam from the pipe enters the milk, where steam condenses to water.

The steam and hot water heat the milk.

(i) Describe, in terms of energy, how the arrangement and movement of particles in the steam changes as the steam enters the milk, condenses and cools.

(2)

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(ii) The specific heat capacity of milk is 3840 J/kg K.

The specific heat capacity of water is 4200 J/kg K.

The specific latent heat of condensation of steam is 2260 kJ/kg.

The temperature of the steam is 100°C

The mass of steam that condenses is 25 g.

The temperature of the milk rises from 5°C to 65°C.

By considering the transfer of energy from the steam to the milk, calculate the mass of milk that is heated by the steam and hot water.

Use equations from the formula sheet.

(4)

mass of milk = ... kg

(iii) Give **two** reasons why the actual mass of steam needed to heat the milk from 5°C to 65°C is greater than 25 g.

(2)

1 .....

.....

2 .....

.....

(Total for question = 8 marks)

(**Q10b 1SC0/2PH, SAM 2016**)

Q38.

* Some research has been carried out into replacing fluorescent lamp fittings with LED fittings.



photo of stairwell
with fluorescent fitting



photo of stairwell
with LED fitting

The data in the table is taken from the report of a trial using LEDs to light stairwells and corridors in a large building.

total energy saved each year by using LEDs	3 000 kW h
LED fitting cost	£2 000
CO_2 saving each year by using LEDs	1.6 tonnes
change in lighting levels by using LEDs	200%
average price of electrical energy	14 p / kW h
average lifetime of LED fittings	50 000 hours
average lifetime of fluorescent fittings	10 000 hours

Use the information to discuss the benefits of replacing fluorescent fittings with LED fittings.

(6)

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(**Q25 1SC0/2PF, June 2013**)

Q39.

Figure 8 shows a demolition ball of mass 400 kg.

The ball is used to demolish a wall.

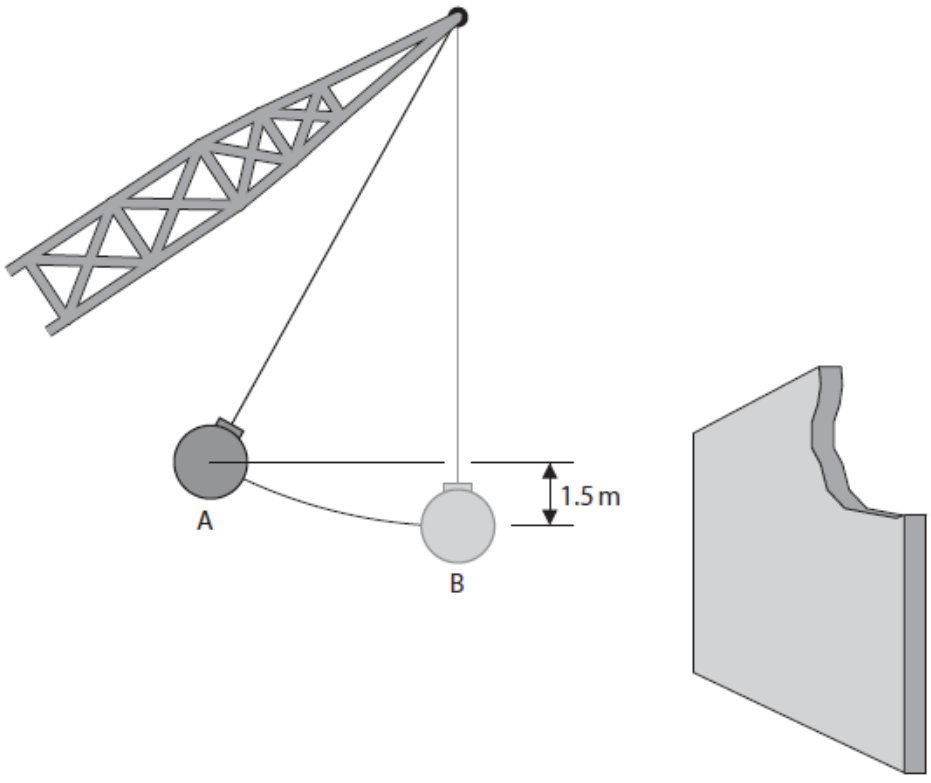


Figure 8

As the ball swings from A to B, it moves through a vertical height of 1.5 m.

(i) Calculate the change in gravitational potential energy.

Take gravitational field strength, g, to be 10 N/kg.

(3)

(ii) The heavy ball comes to rest soon after smashing into the wall. In doing this, the temperatures of the ball, wall and surroundings all increase slightly.

Explain this observation.

(2)

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(iii) Which of these quantities of the ball changes in **both** magnitude and direction while the ball is swinging?

Put a cross ☒ in the box next to your answer.

(1)

☒ **A** gravitational potential energy

☒ **B** velocity

☒ **C** the gravitational force acting

☒ **D** kinetic energy

(Total for question = 6 marks)

(**Q06a 1SC0/2PH/S2, SAM**)

Q40.

An electric motor is used to lift a box.

Figure 9 shows how the efficiency of the electric motor changes as the mass of the box increases.

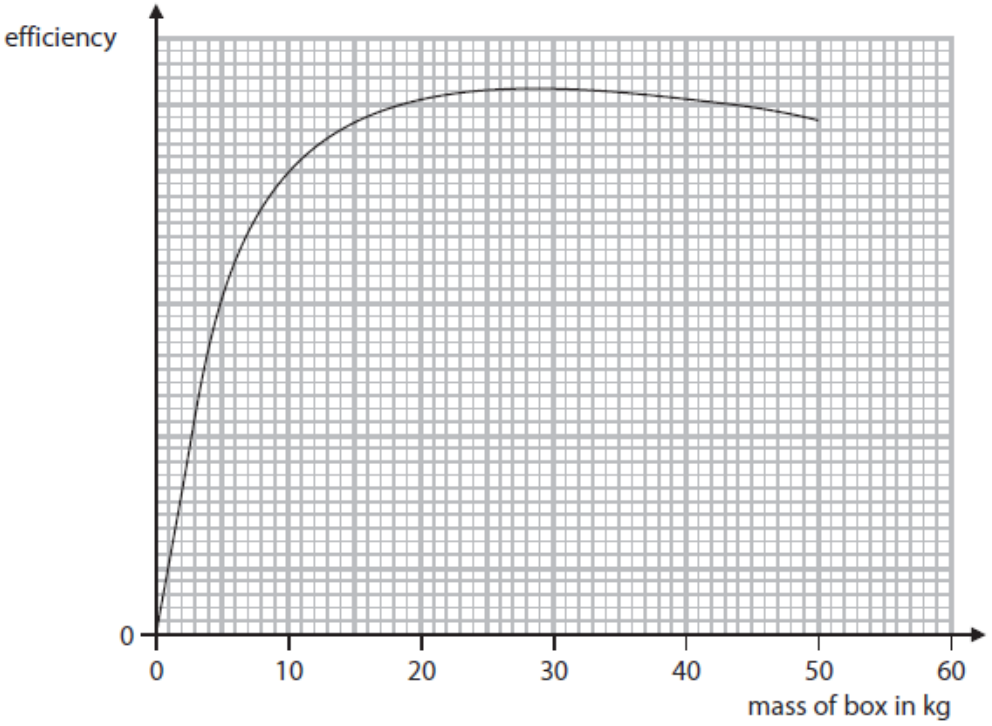


Figure 9

Describe how the efficiency of the electric motor depends on the mass of the box lifted.

(2)

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(Total for question = 2 marks)

(**Q05c 1SC0/2PF/S2, SAM**)