Questions

Q1.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Which of these is the equation for work done?

(1)

☒ **A** work done = force ÷ distance moved in direction of force

☒ **B** work done = force × distance moved in direction of force

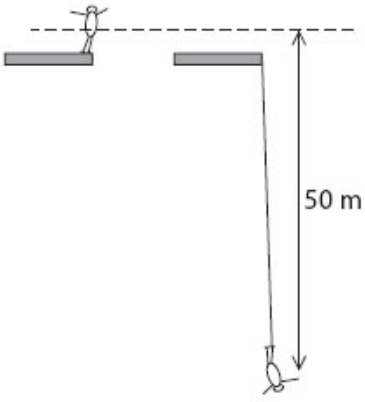
☒ **C** work done = force ÷ distance moved at right angles to direction of force

☒ **D** work done = force × distance moved at right angles to direction of force

(Total for question = 1 mark)

Q2.

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

Q3.

Some students investigate the efficiency of electric motors.

One of the students states that all of the energy supplied to a motor is transferred into other forms.

Complete the following sentence by putting a cross (☒) in the box next to your answer.
This statement is one example of the idea of

(1)

☒ **A** renewable energy

☒ **B** conservation of energy

☒ **C** non-renewable energy

☒ **D** sustainable energy

Q4.

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.

Describe the energy transfers that happen when the cyclist uses the brakes to stop.

(2)

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(Total for question = 2 marks)

Q5.

A pilot begins to land an aircraft.

The height of the aircraft decreases from 200 m above the ground to 100 m.

(i) What happens to the gravitational potential energy of the aircraft?

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

(1)

☒ **A** it becomes zero

☒ **B** it decreases

☒ **C** it does not change

☒ **D** it increases

(ii) The velocity of the aircraft remains constant.

What happens to the kinetic energy of the aircraft?

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

(1)

☒ **A** it becomes zero

☒ **B** it decreases

☒ **C** it does not change

☒ **D** it increases

Q6.

A student plots a graph showing the height at the start and the maximum height reached after each bounce.

Figure 16 shows the student's graph.

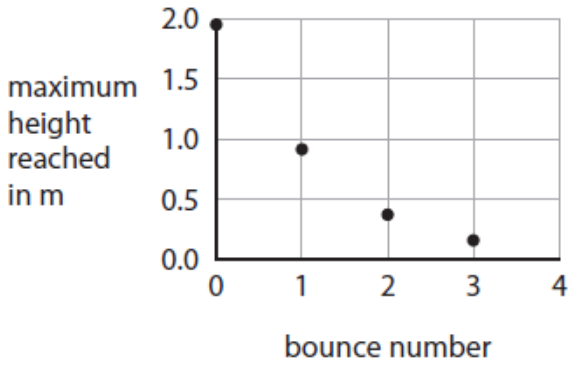

Figure 16

Describe how the maximum height reached changes with the bounce number in Figure 16.

(2)

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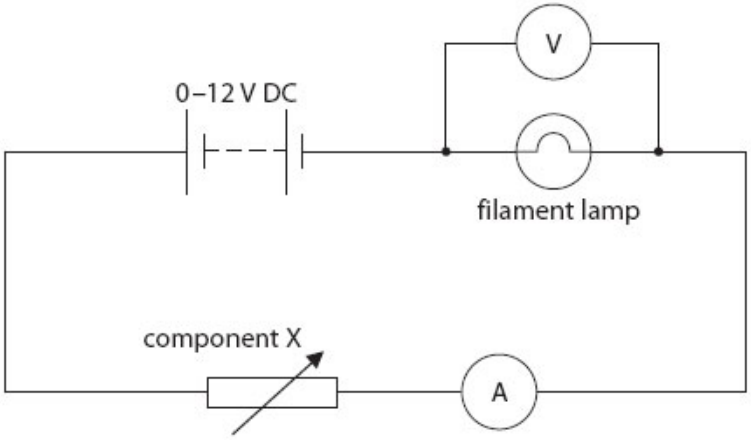
(Total for question = 2 marks)

Q7.

A student sets up an experiment to measure the potential difference (voltage) across a filament lamp.

She changes the current through the lamp.

The diagram shows the circuit she used.



(d) Describe the energy transfer that takes place in the lamp.

(2)

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Q8.

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)

Q9.

Andrew skis down a hill.

Andrew starts from the top of the hill and his speed increases as he goes downhill.

He controls his speed and direction by using his skis.

He brings himself to a stop at the bottom of the hill.

Describe the energy changes that happen between starting and stopping.

(3)

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Q10.

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.

The cyclist starts to cycle again.

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)

Q11.

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.

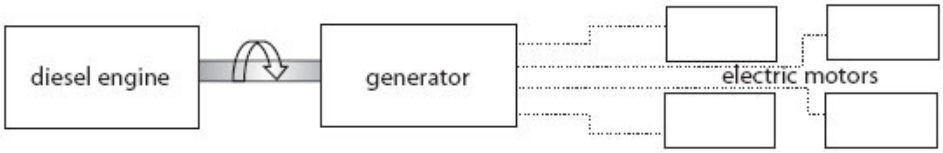
Calculate the work done on the egg to lift it up by 20 m. State the unit.

(3)

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

Q12.

A train is powered by a diesel engine.
The diesel engine is used to turn a generator.
The generator provides electricity for electric motors which drive the wheels.



(i) Draw one straight line from each train part to its useful energy transfer.

(3)

train part	useful energy transfer
diesel engine	chemical to electrical
generator	chemical to kinetic
motor	electrical to kinetic
	kinetic to chemical
	kinetic to electrical

(ii) State **one** example of a non-useful energy transfer in the motor.

(1)

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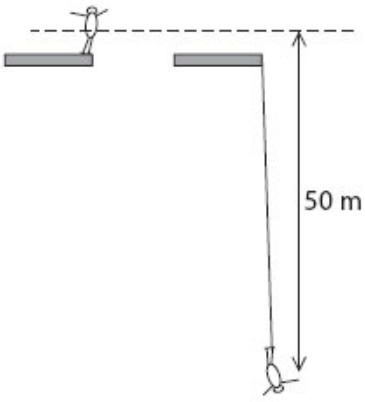
Q13.

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.

(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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Q14.

(a) Which of these situations can increase the reaction time of a driver?

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

(1)

☒ **A** an icy road

☒ **B** worn tyres on his car

☒ **C** stopping for a cup of coffee

☒ **D** driving for a long time without taking a break

(b) (i) A car engine produces an average driving force of 1200 N.

The car travels 8.0 m.

Calculate the work done by the force over this distance.

(2)

work done = ... J

(ii) The car has a mass of 1400 kg and travels at a velocity of 25 m/s.

Calculate the kinetic energy of the car.

(3)

kinetic energy = ... J

Q15.

(a) Which of these situations can increase the reaction time of a driver?

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

(1)

☒ **A** an icy road

☒ **B** worn tyres on his car

☒ **C** stopping for a cup of coffee

☒ **D** driving for a long time without taking a break

(b) (i) A car engine produces an average driving force of 1200 N.

The car travels 8.0 m.

Calculate the work done by the force over this distance.

(2)

work done = ... J

(ii) The car has a mass of 1400 kg and travels at a velocity of 25 m/s.

Calculate the kinetic energy of the car.

(3)

kinetic energy = ... J

Q16.

In many sports events, an athlete tries to throw an object as far as possible.

(a) Sport scientists can use many words to describe the throwing of an object.
Four of these words are shown in the box.
Only one of these is a vector.

energy	momentum	power	speed

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

The vector is

(1)

☒ **A** energy

☒ **B** momentum

☒ **C** power

☒ **D** speed

(ii) Complete the sentence by using a word from the box above.

(1)

The rate of doing work is called
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(b) A javelin has a mass of 0.8 kg. In one throw, the javelin left the athlete's hand at a velocity of 25 m/s.

(i) Calculate the kinetic energy of the javelin as it left the athlete's hand. State the unit.

(3)

kinetic energy = ... unit .....

(ii) State the amount of work done by the athlete on the javelin to get it to a velocity of 25 m/s.

(1)

work done = ...

(iii) A good javelin thrower will try to extend their arm as much as possible before releasing the javelin.

Explain why this allows them to do more work on the javelin.

(2)

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(Total for Question = 8 marks)

Q17.

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.

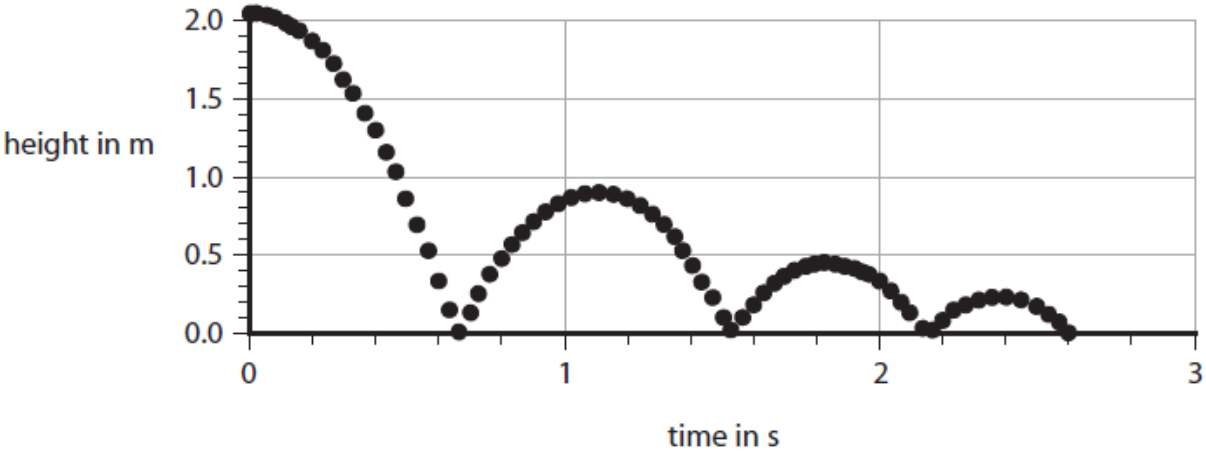

Figure 7

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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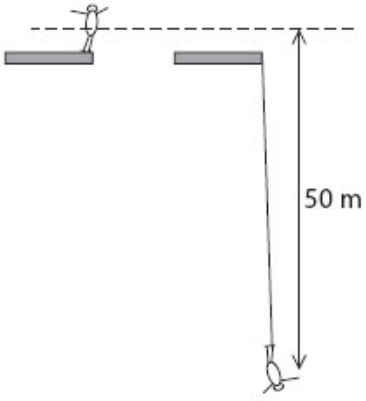
(Total for question = 8 marks)

Q18.

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)

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(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)

Q19.

Andrew skis down a hill.

(a) Andrew starts from the top of the hill and his speed increases as he goes downhill.

He controls his speed and direction by using his skis.

He brings himself to a stop at the bottom of the hill.

Describe the energy changes that happen between starting and stopping.

(3)

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(b) Andrew returns to the top of the hill and starts again.

(i) His mass is 67 kg.

Show that his momentum is about 2000 kg m/s when his velocity is 31 m/s.

(2)

(ii) He falls over when his momentum is 2000 kg m/s.

After he falls over, he slows down by sliding across the snow.

It takes 2.3 s for his momentum to reduce to zero.

Calculate the average force on Andrew as he slows down.

(2)

force = ...N

(iii) Andrew is not injured by the fall even though he was moving quickly.

Use ideas about force and momentum to explain why he is not injured.

(2)

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(Total for Question is 9 marks)