5.2 Work Done & Energy Transfer

Question Paper

Course	AQA GCSE Physics
Section	5. Forces
Topic	5.2 Work Done & Energy Transfer
Difficulty	Medium

Time allowed: 60

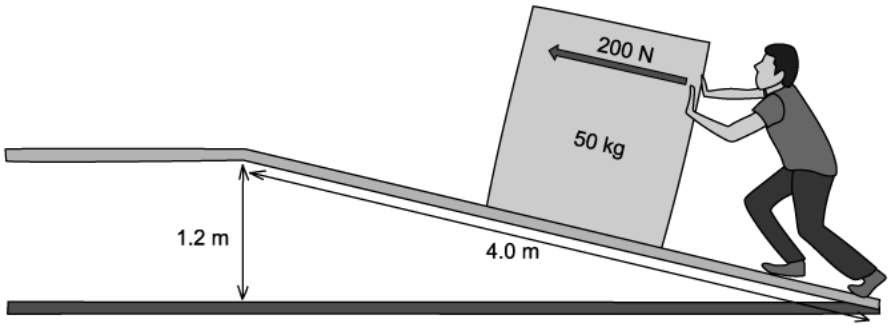
Score: /45

Percentage: /100

Question 1a

A builder pushes a heavy crate up a slope, as shown in **Figure 1.**

Figure 1



(a)
State the equation that links the change in gravitational potential energy (E) to the mass of the object (m), the gravitational field strength (g) and the change in height (h).

[1 mark]

[1 mark]

Question 1b

(b)
The crate has a mass of 50 kg.

Calculate the gain in gravitational potential energy of the crate.

Gravitational field strength = 9.8 N / kg.

[2 marks]

[2 marks]

Question 1c

(c)
The builder pushes the crate with a force of 200 N.

Calculate the work done by the builder.

[4 marks]

[4 marks]

Question 1d

(d)
Explain why your answers to questions (b) and (c) are different to each other.

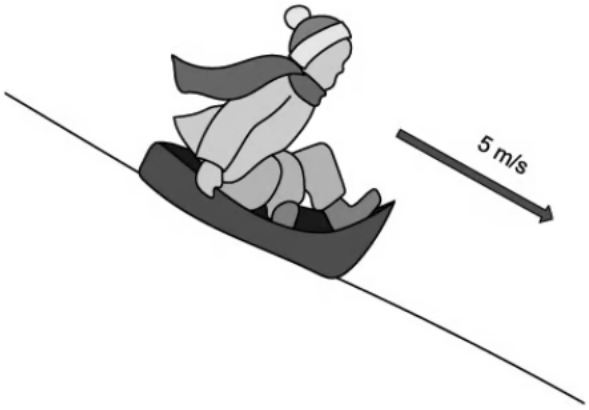
[2 marks]

[2 marks]

Question 2a

A girl rides a sledge down a smooth snowy slope, as shown in **Figure 2**.

Figure 2



(a)
To begin with the sledge accelerates, but after a while it starts to travel at a constant speed.

Explain why.

[3 marks]

[3 marks]

Question 2b

(b)
Whilst travelling at a constant speed of 5 m/s, the girl travels a distance of 200 m and descends a vertical height of 25 m.

The girl and sledge have a combined mass of 50 kg.

Calculate the change in the gravitational potential energy of the girl and sledge.

Gravitational field strength = 9.8 N/kg

[3 marks]

[3 marks]

Question 2c

(c)
As the sledge descends the slope friction does work against the sledge.

Calculate the average frictional force acting on the sledge.

[3 marks]

[3 marks]

Question 2d

(d)
Calculate the kinetic energy of the girl and the sledge.

[3 marks]

[3 marks]

Question 2e

(e)
Eventually the slope levels out and the sledge slows down and comes to a halt.

Assuming that the frictional force on the sledge remains the same as that calculated in part (c), calculate the distance it will take the sledge to come to a halt.

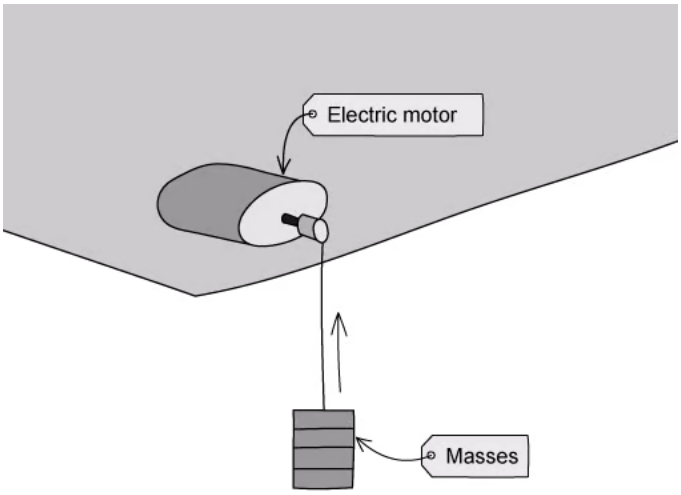
[3 marks]

[3 marks]

Question 3a

A student carries out an experiment which involves using an electric motor to lift some masses, as shown in **Figure 3**.

Figure 3



(a)
At one point, a mass of 200 g is lifted.

Calculate the weight of this mass.

Gravitational field strength = 9.8 N/kg

Give your answer to **2** significant figures

[3 marks]

[3 marks]

Question 3b

(b)
Calculate the work done by the motor when it lifts the above mass a height of 90 cm.

[3 marks]

[3 marks]

Question 3c

(c)
The student estimates that the efficiency of the motor is about 20%.

Calculate the amount of total energy supplied to the motor.

[3 marks]

[3 marks]

Question 4a

A car is travelling at a steady speed of 15 m/s when the driver suddenly has to brake.

The car has a total mass of 1500 kg.

(a)
Calculate the kinetic energy of the car, just before the brakes are applied.

[2 marks]

[2 marks]

Question 4b

(b)
State the work done by the brakes in stopping the car.

[1 mark]

[1 mark]

Question 4c

(c)
The brakes apply a force of 12 000 N on the car.

Calculate the braking distance of the car.

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

[3 marks]

[3 marks]

Question 4d

(d)
Explain what happens to the kinetic energy of the car as it slows down and the effect that it will have on the brakes.

[2 marks]

[2 marks]

Question 4e

(e)
Electric cars are fitted with regenerative braking systems.

These systems consist of generators attached to the car's wheels.

Electric cars are also fitted with standard brakes alongside the regenerative ones.

Explain the advantages of both regenerative brakes and standard brakes.

[4 marks]

[4 marks]