Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

This question is about energy transfers.

Figure 13 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.

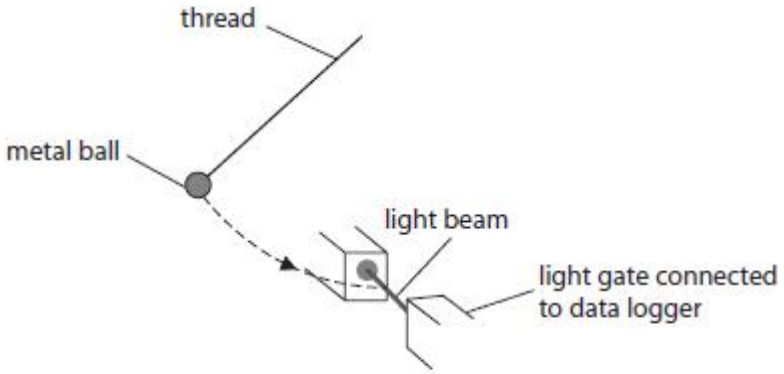


Figure 13

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 14.

speed in m/s	1.31	1.27	1.16

Figure 14

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)

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change in gravitational potential energy = ... J

(Total for question = 3 marks)

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Q2.

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)

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Q3.

A 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 4s for the drone to rise through 20m.

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

(2)

useful power developed = ... W

(Total for question = 5 marks)

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Q4.

This question is about energy changes.

Figure 11 shows a water slide.
A person travels from the top to the bottom of the water slide.

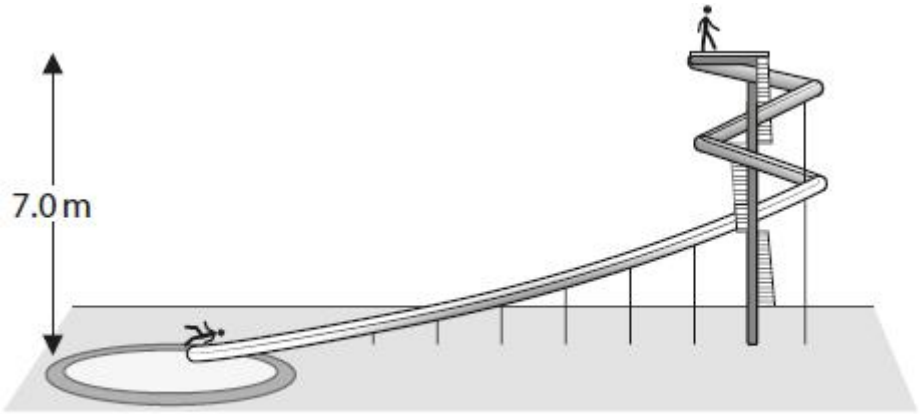


Figure 11

(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

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)

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(Total for question = 4 marks)

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Q5.

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

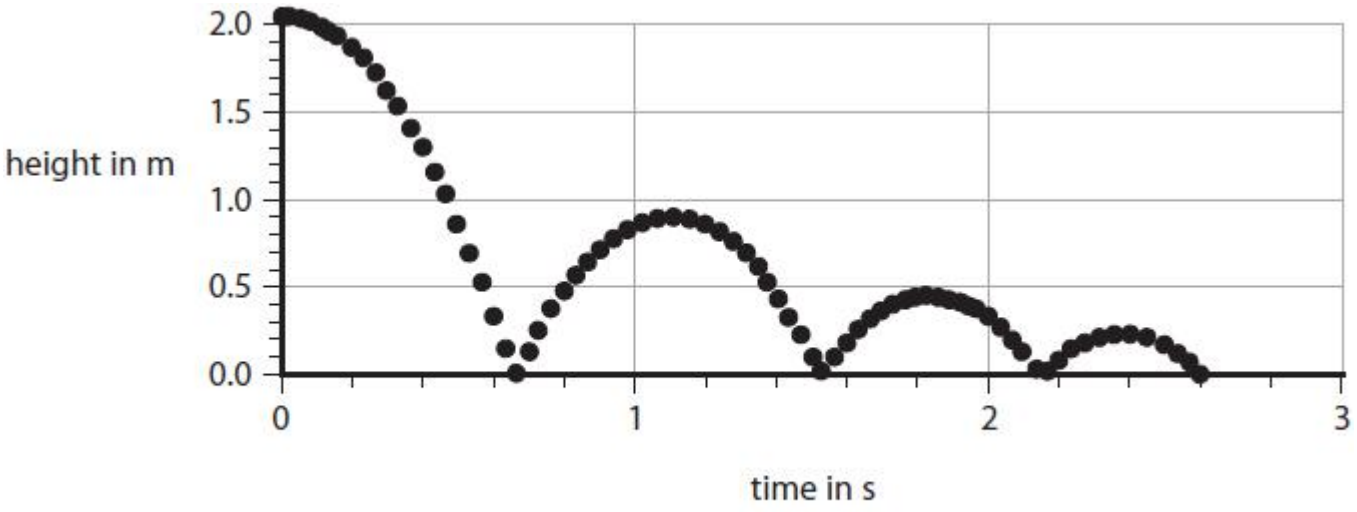


Figure 15

Use Figure 15 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)

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