

Energy, Work and Power

Question Paper 5

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Energy, Work and Power
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 5

Time Allowed: 46 minutes

Score: /38

Percentage: /100

- 2 Fig. 1.1 shows a simple pendulum being used by a student to investigate the energy changes at various points in the pendulum's swing.

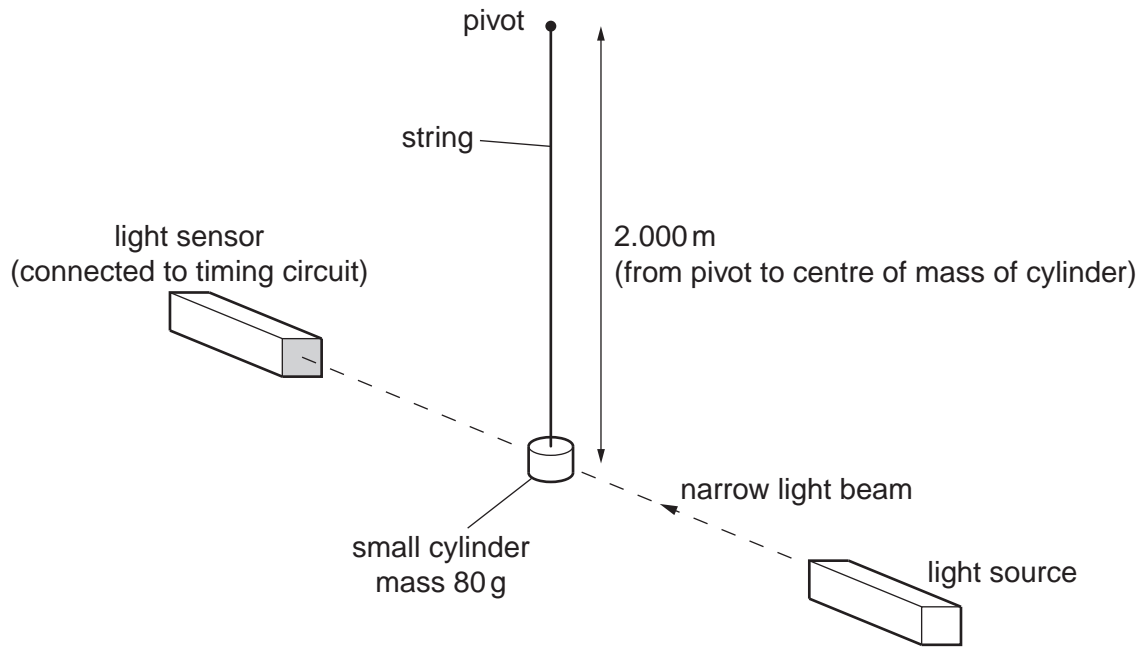


Fig. 1.1

- (a) When the string is displaced by a small angle from the vertical, the height of the cylinder changes so that its centre of mass is now 1.932 m below the pivot. Determine the gravitational potential energy gained by the cylinder. Use $g = 10 \text{ m/s}^2$.

gravitational potential energy gained = [3]

- (b) The cylinder is released from the displaced position in (a). Calculate the expected speed of the cylinder when the string is vertical.

expected speed = [2]

(c) As the string passes through the vertical, the narrow beam of light is interrupted by the cylinder for 22 ms. The cylinder has a diameter of 2.5 cm.

(i) Calculate the actual speed of the cylinder.

actual speed =

(ii) Suggest how the difference between the actual and expected speeds could occur.

.....
.....
.....
.....

[3]

[Total: 8]

- 3 The racing car shown in Fig. 2.1 uses a Kinetic Energy Recovery System (KERS). This system stores within the car some of the kinetic energy lost when the car slows down for a corner. The driver can later release the stored energy when maximum power is required.

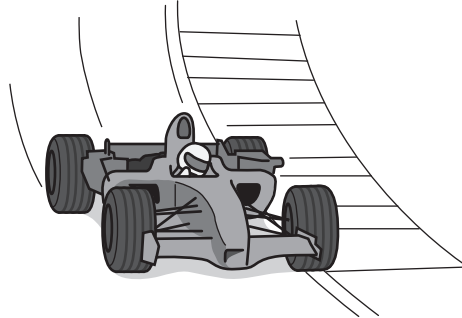


Fig. 2.1

- (a) The car approaches a corner and decelerates from 82 m/s to 61 m/s in 0.90 s. Calculate the deceleration.

deceleration = [2]

- (b) (i) The energy lost during the braking in (a) is 8.4×10^5 J. 40% of this lost energy is directed to the KERS system. Determine the amount of energy stored.

energy stored =

- (ii) The driver later uses all of this stored energy to give 60 kW of useful extra power for 3.0 s. Calculate the energy released.

energy released =

(iii) Calculate the efficiency of the KERS system.

efficiency =
[4]

(c) Suggest a possible device to store energy when a moving vehicle slows down. For this device, state the change that occurs as more energy is stored.

device

change

.....

..... [2]

[Total: 8]

4 Two workmen are employed on a building project, as shown in Fig. 5.1.

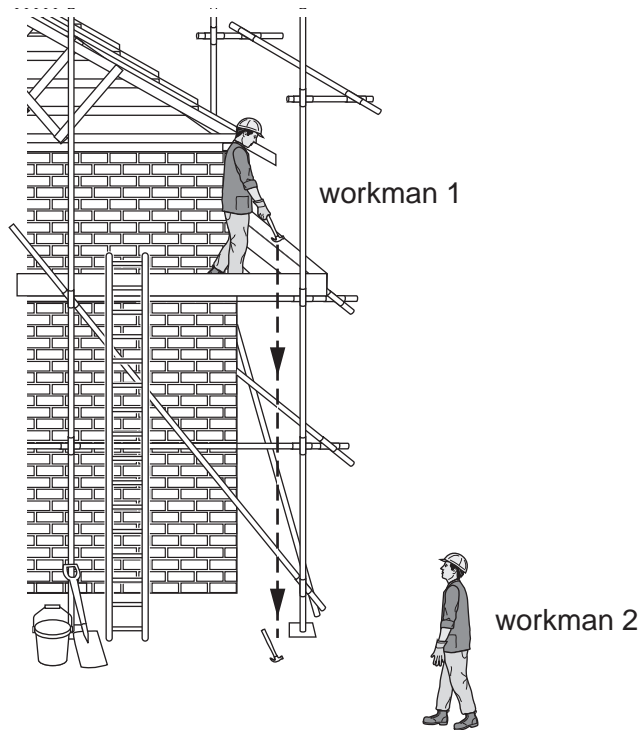


Fig. 5.1

- (a) Workman 1 drops a hammer, which falls to the ground. The hammer has a mass of 2.0 kg, and is dropped from a height of 4.8 m above the ground.
- (i) Calculate the change in gravitational potential energy of the hammer when it is dropped.

change in gravitational potential energy =[2]

- (ii) Describe the energy changes from the time the hammer leaves the hand of workman 1 until it is at rest on the ground.

.....
.....
.....
.....[2]

(b) Workman 2 picks up the hammer and takes it back up the ladder to workman 1.

He climbs the first 3.0m in 5.0s. His total weight, including the hammer, is 520 N.

(i) Calculate the useful power which his legs are producing.

power =[2]

(ii) In fact his body is only 12% efficient when climbing the ladder.

Calculate the rate at which energy stored in his body is being used.

rate =[1]

[Total: 7]

- 5 A car of mass 900 kg is travelling at a steady speed of 30 m/s against a resistive force of 2000 N, as illustrated in Fig. 2.1.

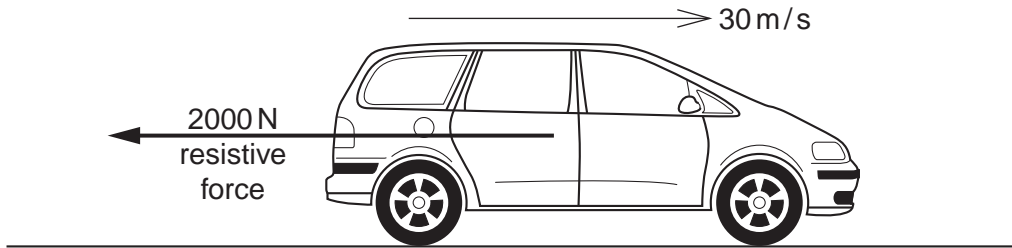


Fig. 2.1

- (a) Calculate the kinetic energy of the car.

kinetic energy = [2]

- (b) Calculate the energy used in 1.0 s against the resistive force.

energy = [2]

- (c) What is the minimum power that the car engine has to deliver to the wheels?

minimum power = [1]

(d) What form of energy is in the fuel, used by the engine to drive the car?

..... [1]

(e) State why the energy in the fuel is converted at a greater rate than you have calculated in **(c)**.

.....
..... [1]

[Total: 7]