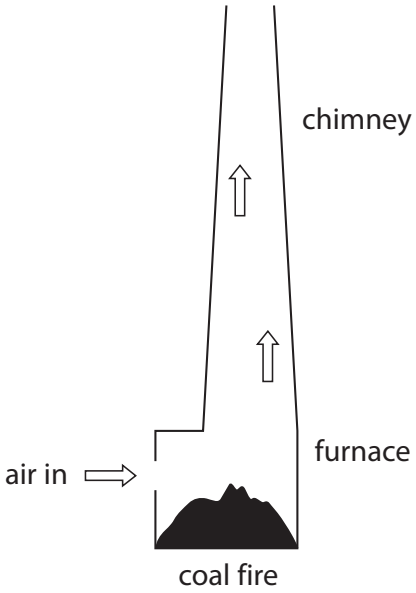
IGCSE Physics - Section 4 – Energy – practice exam questions.

Question 1.

5 The diagram shows a chimney over a furnace.

A coal fire is burning in the furnace.

Air moves into the furnace and up the chimney.



Describe how the process of convection causes this air movement.

(5)

(Total for Question 5 = 5 marks)

Question 2.

7 In 2013, the UK Government decided to build another nuclear power station at Hinckley Point. Hinckley Point is in Somerset, a major agricultural area of the UK.
This will be the third nuclear power station at the site.

©guardian

Discuss the advantages and disadvantages of nuclear power stations and biomass power stations.

(6)

(Total for Question 7 = 6 marks)

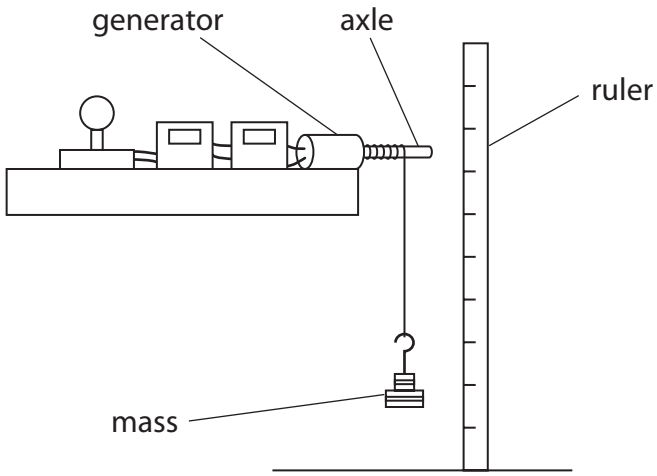
Question 3.

8 (a) A student investigates the energy transfers in a small generator.

She connects the generator to a circuit that includes a lamp.

She hangs a mass from a string wound around the axle.

The lamp lights as the mass falls to the ground.



The table shows the student's results.

height that mass falls	0.61 m
mass	2.75 kg
time taken for mass to fall	1.3 s
average current in the lamp	0.46 A
average voltage across the lamp	12.7 V

(i) State the equation linking gravitational potential energy, mass, *g* and height.

(1)

(ii) Calculate the gravitational potential energy, GPE, lost by the mass.

(2)

GPE = ... J

(iii) Explain why only some of the gravitational potential energy of the mass is transferred to the lamp.

(2)

.....

.....

.....

.....

(iv) Calculate the energy transferred to the lamp.

(2)

energy transferred = ... J

(b) Water from a reservoir can be used to generate electricity on a large scale.

Describe the energy transfers involved in this process.

(3)

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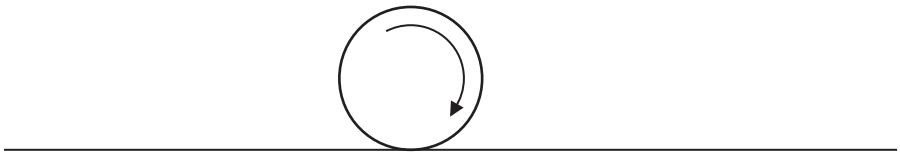
(Total for Question 8 = 10 marks)

Question 4.

13 A golfer practises hitting balls on a golf course.

(a) Ball X rolls along level ground, as shown in the diagram.



(i) Add labelled arrows to the diagram to show the directions of two of the forces acting on ball X.

(2)

(ii) Explain why ball X slows down and stops.

(3)

(b) The golfer hits ball Y at an angle into the air.

He gives it the same initial kinetic energy as ball X.

Suggest why ball Y travels much further than ball X before it stops.

(1)

(c) The mass of ball Y is 45 g.

The golfer gives the ball 36 J of kinetic energy when he hits it.

(i) State the equation linking kinetic energy, mass and speed.

(1)

(ii) Calculate the initial speed of ball Y.

(4)

initial speed = ... m/s

(iii) Ball Y reaches a maximum height of 30 m.

Suggest how the golfer should hit ball Y so it can reach a greater height.

(1)

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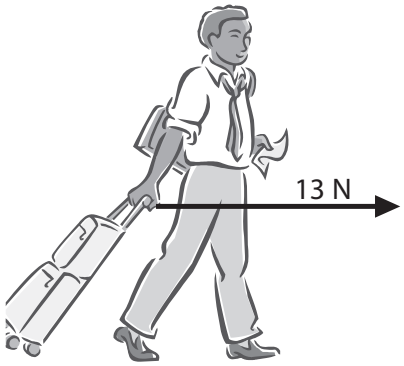
(Total for Question 13 = 12 marks)

Question 5.

6 A person has a suitcase with wheels.



(a) The person pulls the suitcase with a horizontal force of 13 N for 110 m.

(i) State the equation linking work done, force and distance moved.

(1)

(ii) Calculate the work done on the suitcase by the person.

(2)

work done = ... J

(iii) How much energy is transferred to the suitcase?

(1)

energy transferred = ... J

(b) The suitcase falls over.

Explain why it loses gravitational potential energy when it falls.

(2)

.....

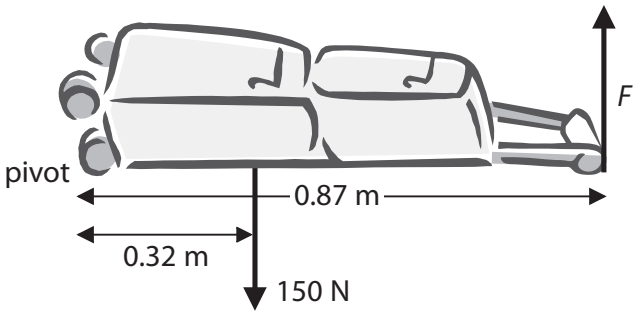
.....

.....

.....

(c) The person starts to raise the suitcase again by pulling on the handle with force *F*.

The weight of the suitcase is 150 N.



(i) State the equation linking moment, force and perpendicular distance from the pivot.

(1)

.....

(ii) Calculate the force *F* that the person must apply on the handle to start raising the suitcase.

(3)

force *F* = ... N

(Total for Question 6 = 10 marks)

Question 6.

7 A flying squirrel is an animal that can glide through the air.

It spreads out its limbs to stretch a membrane that helps it to glide.

© Robert Savannah

(a) The mass of a flying squirrel is 0.19 kg.

It climbs 17 m up a tree.

(i) State the equation linking gravitational potential energy (GPE), mass, *g* and height.

(1)

(ii) Calculate the GPE gained by the squirrel during this climb.

(2)

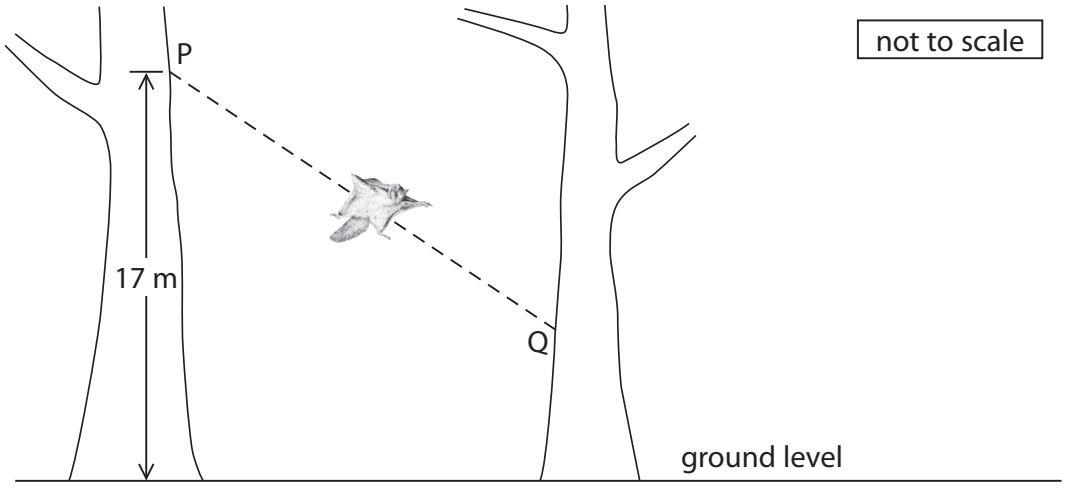
GPE = ... J

(iii) State the amount of work done against the force of gravity by the squirrel during this climb.

(1)

work done = ... J

(b) The flying squirrel glides from P to Q with a constant velocity of 13 m/s.



(i) Add labelled arrows to the diagram to show the directions of the forces of weight and drag acting on the squirrel.

(2)

(ii) State the equation linking kinetic energy (KE), mass and velocity.

(1)

(iii) Calculate the KE of the squirrel as it glides.

(2)

KE = ... J

(iv) The velocity of the squirrel decreases to zero when it reaches the second tree because

(1)

☒ **A** an unbalanced force acts on the squirrel

☒ **B** no force acts on the squirrel

☒ **C** the GPE of the squirrel increases

☒ **D** the KE of the squirrel increases

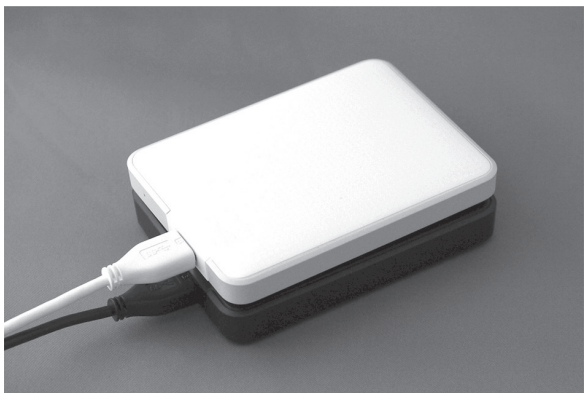
(Total for Question 7 = 10 marks)

Question 7.

9 A student has two computer hard drives.

One is black and one is white.

The student places the white hard drive on top of the black one as shown in photograph A.



Photograph A

The student connects both hard drives to a computer so that they receive the same amount of electrical power. The temperature of the hard drives rises as they work.

The student then rearranges the hard drives so that the black one is on top as shown in photograph B.

Photograph B

The hard drives are still working, but their temperature is lower than before.

Explain why the hard drives work at a lower temperature when the black one is on top.

(4)

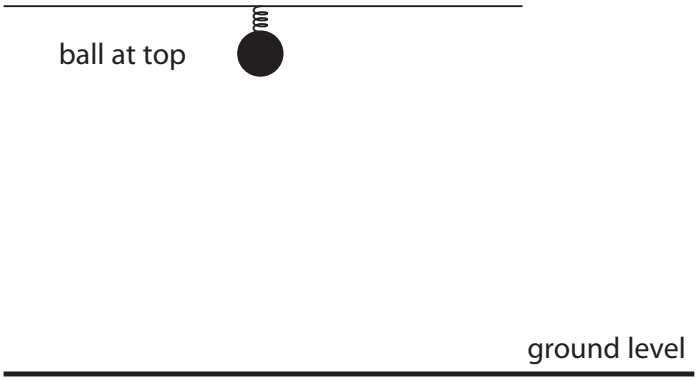
(Total for Question 9 = 4 marks)

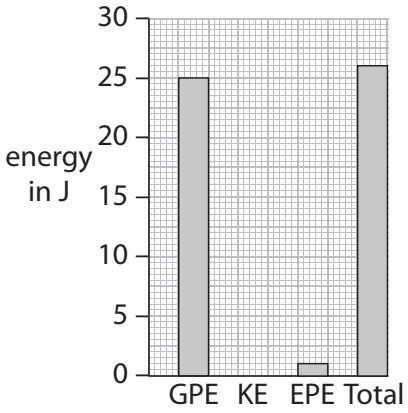
Question 8.

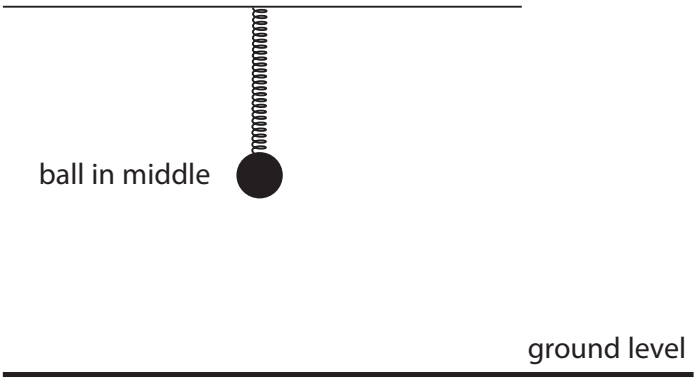
11 A student investigates how the energies of a ball and spring change when the ball and spring vibrate together.

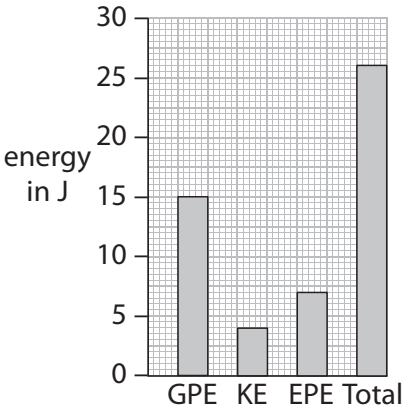
The diagrams and bar charts show how the energies of the ball and spring vary with the position of the ball.

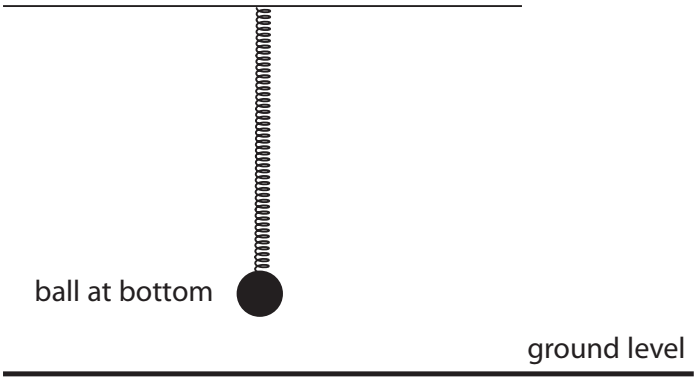
The ball has a mass of 1 kg.

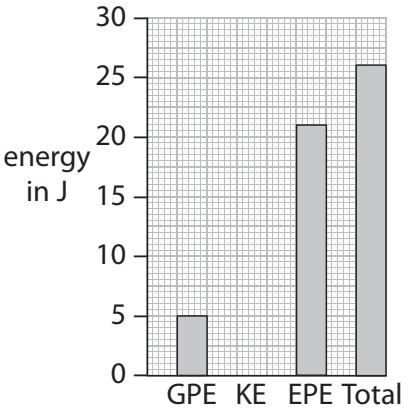












GPE = gravitational potential energy of the ball (zero at ground level)

KE = kinetic energy of the ball

EPE = elastic potential energy of the spring

Use information from the diagrams and the bar charts to describe what happens to the energy, speed and position of the ball as it vibrates on the spring.

(6)

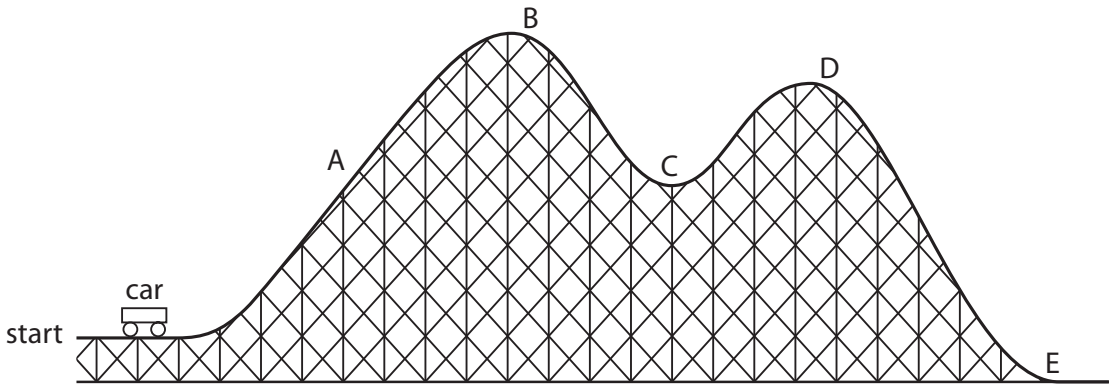
(Total for Question 11 = 6 marks)

Question 9.

Answer ALL questions.

1 The diagram shows a roller-coaster ride.

The car is pulled slowly from the start to point B and then released.



(a) Choose letters from the diagram to complete this sentence.

(2)

The car has the most gravitational potential energy at point .....

and it goes fastest at point ..... .

(b) The mass of the car is 900 kg.

The maximum speed of the car is 15 m/s.

(i) State the relationship between momentum, mass and velocity.

(1)

(ii) Calculate the maximum momentum of the car.

Give the unit.

(3)

maximum momentum = ... unit .....

(iii) State the equation linking kinetic energy (KE), mass and speed.

(1)

(iv) Calculate the maximum KE of the car.

(2)

maximum KE = ... J

(Total for Question 1 = 9 marks)