6.2 Energy: GPE & KE

Question Paper

Course	CIE A Level Physics (9702) 2019-2021
Section	6. Work, Energy & Power
Topic	6.2 Energy: GPE & KE
Difficulty	Hard

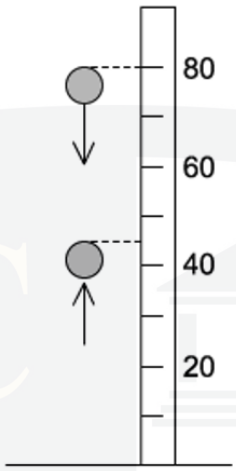
Time allowed: **10**

Score: **/10**

Percentage: **/100**

Question 1

A solid rubber ball has a diameter of 8.0 cm. It is released from rest with the top of the ball 80 cm above a horizontal surface. It falls vertically and then bounces back up so that the maximum height reached by the top of the ball is 45 cm, as shown.



If the kinetic energy of the ball is 0.75 J just before it strikes the surface, what is its kinetic energy just after it leaves the surface?

A 0.36 J **B** 0.39 J **C** 0.40 J **D** 0.42 J

[1 mark]

Question 2

A falling mass pulls a trolley from rest on a horizontal table. Given that:

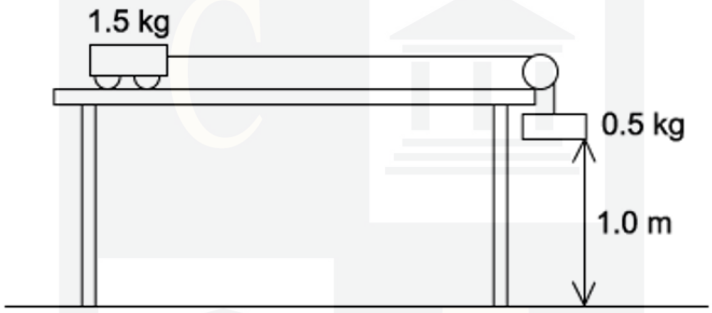
The mass of the trolley = 1.5 kg

The mass of the falling mass = 0.5 kg

The distance the mass falls through = 1.0 m

Frictional force from the table = 0.8 N

The distance the trolley moves = 1.2 m



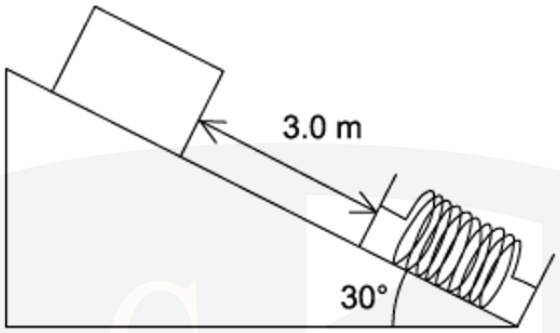
What is the maximum kinetic energy of the trolley?

A 3.0 J **B** 4.9 J **C** 15 J **D** 20 J

[1 mark]

Question 3

A block of mass 12 kg is released from rest and it slides down a 30˚ frictionless incline plane. It is stopped by a spring with a spring constant *k* as shown below.



The initial distance between the point of release and the uncompressed spring is 3.0 m. After the block comes to rest momentarily, the spring is compressed by 1.3 m.

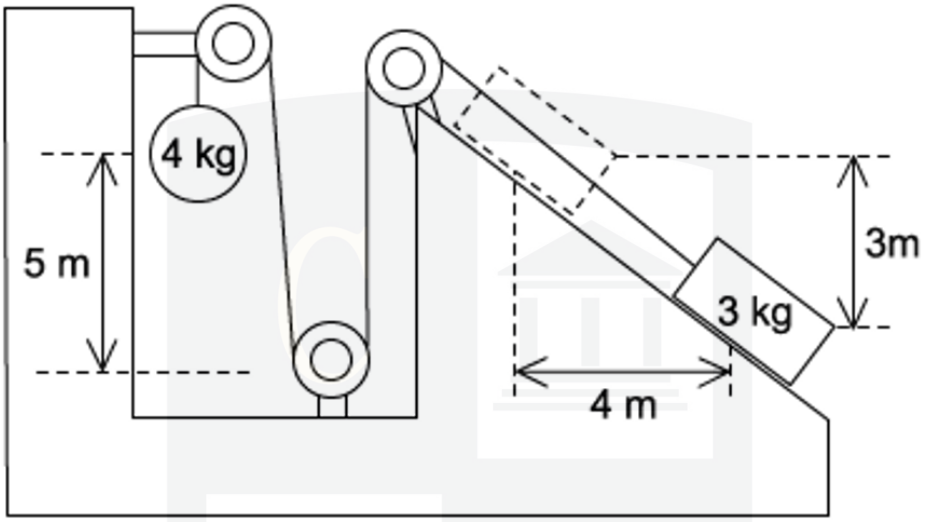
What is the value of *k*?

A 200 N m^{-1} **B** 250 N m^{-1} **C** 300 N m^{-1} **D** 350 N m^{-1}

[1 mark]

Question 4

A 4 kg ball and a 3 kg block of wood were placed in an arrangement as shown below. When the ball was released, it fell through a distance of 5 m, pulling the block of wood up the ramp.



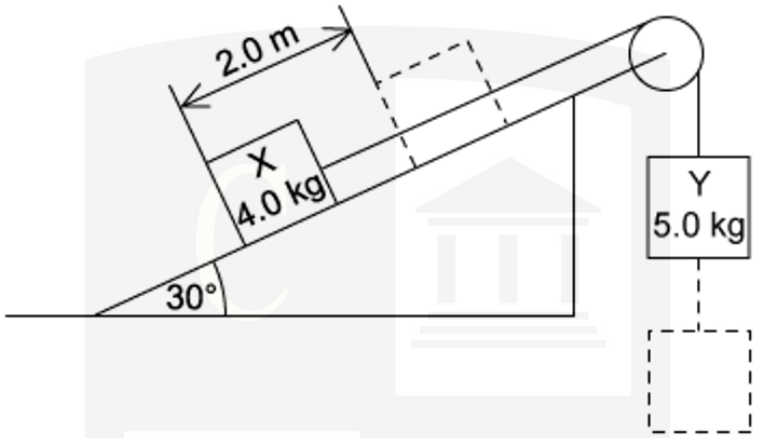
If the pulleys were well oiled and the surface of the ramp exerts a frictional force of 2 N, what is the final speed of the sphere after falling through the 5 m?

A 5.0 m s^{-1} **B** 5.3 m s^{-1} **C** 6.9 m s^{-1} **D** 10.0 m s^{-1}

[1 mark]

Question 5

The diagram shows two bodies X and Y connected by a light cord passing over a light, free-running pulley. X starts from rest and moves on a smooth plane inclined at 30˚ to the horizontal.



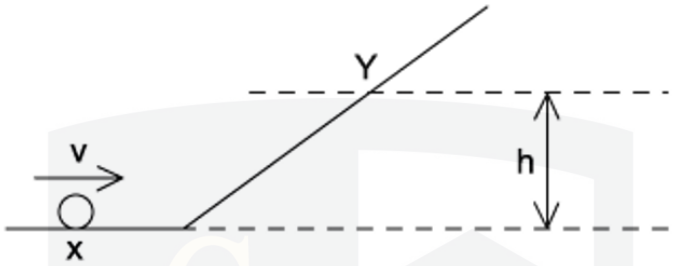
What will be the total kinetic energy of the system when X has travelled 2.0 m along the plane?

A 20 J **B** 59 J **C** 64 J **D** 132 J

[1 mark]

Question 6

An object of mass m passes a point X with a velocity *v* and slides up a frictionless incline to stop at point Y which is at a height *h* above X



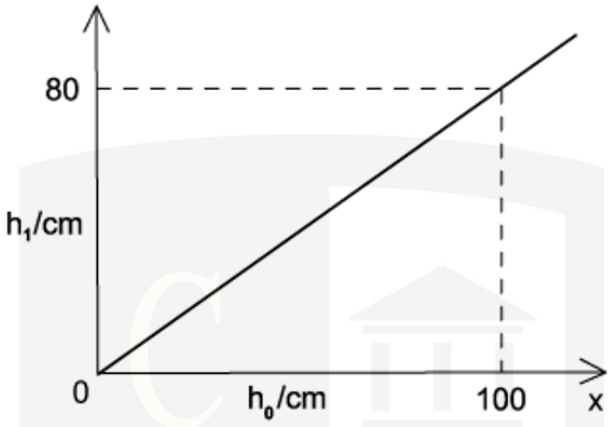
A second object of mass ½ *m* passes X with a velocity of ½ *v*. To what height will it rise?

A $\frac{h}{4}$ **B** $\frac{h}{2}$ **C** $\frac{h}{\sqrt{2}}$ **D** $h\sqrt{2}$

[1 mark]

Question 7

A ball released from a height h_0 above a horizontal surface rebounds to a height h_1 after one bounce. The graph that relates h_0 to h_1 is shown below.



If the ball (of mass m) was dropped from an initial height h and made three bounces, the kinetic energy of the ball immediately after the third impact with the surface was

A $(0.8)^3\, mgh$

B $(0.8)^2\, mgh$

C $[1 - (3 \times 0.2)]\, mgh$

D $[1 - (0.8)^3]\, mgh$

[1 mark]

Question 8

A steel sphere is dropped vertically onto a horizontal metal plate. The sphere hits the plate with a speed u, leaves it at a speed v, and rebounds vertically to half of its original height.

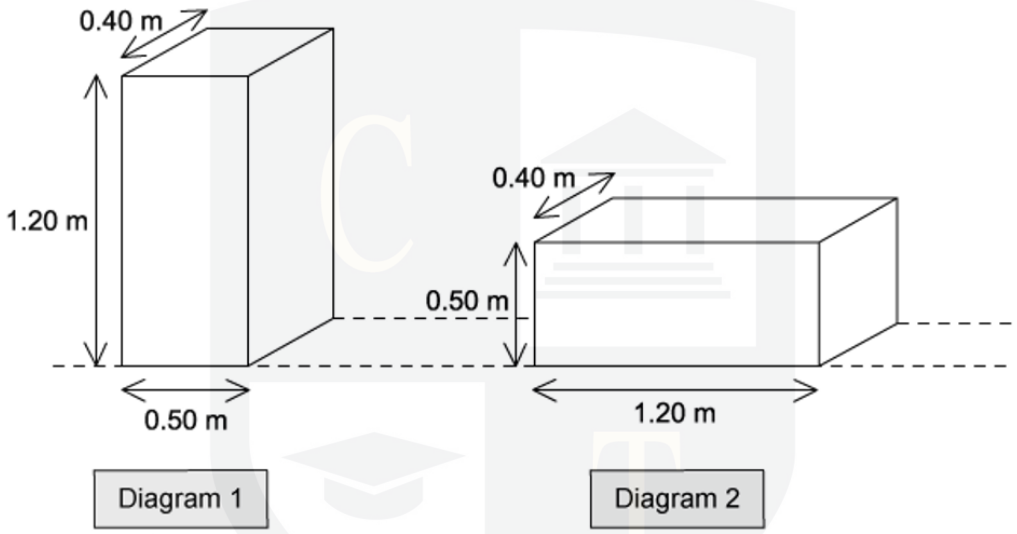
Which expression gives the value of $\frac{v}{u}$?

A $\frac{1}{2^2}$ **B** $\frac{1}{2}$ **C** $\frac{1}{\sqrt{2}}$ **D** $1 - \frac{1}{\sqrt{2}}$

[1 mark]

Question 9

A uniform solid cuboid of concrete of dimensions 0.50m × 1.20m × 0.40m and weight 4000 N rests on a flat surface with the 1.20 m edge vertical as shown in diagram 1.



What is the minimum energy required to roll the cuboid through 90° to the position shown in diagram 2 with the 0.50 m edge vertical?

A 200 J **B** 400 J **C** 1400 J **D** 2600 J

[1 mark]

Question 10

A loaded aeroplane has a total mass of 1.2×10^5 kg while climbing after take-off. It climbs at an angle of 23° to the horizontal with a speed of 50 m s^{-1}.

What is the rate at which it is gaining potential energy at this time?

A 2.3×10^6 J s^{-1}

B 2.5×10^6 J s^{-1}

C 2.3×10^7 J s^{-1}

D 2.5×10^7 J s^{-1}

[1 mark]