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	Medium

Time allowed: **10**

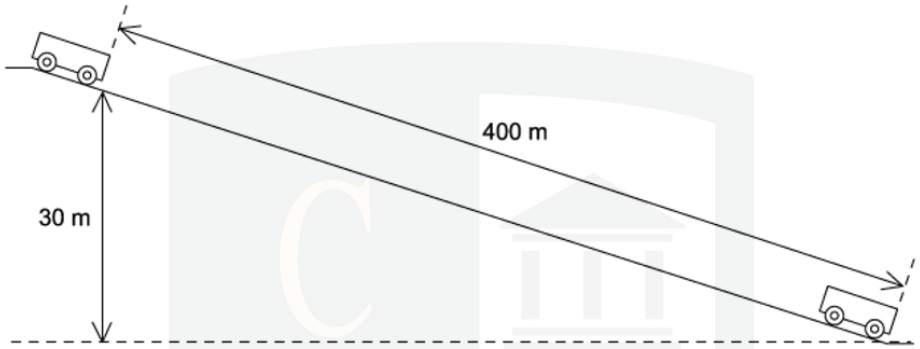
Score: **/10**

Percentage: **/100**

Question 1

A truck of mass 500 kg moves from rest at the top of a section of track 400 m long and 30 m high, as shown.

The frictional force acting on the truck is 250 N throughout its journey



What is the final speed of the truck?

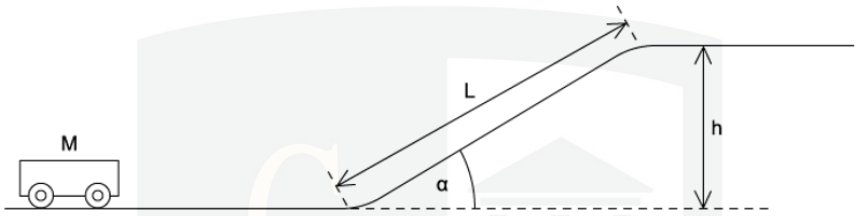
A 14 m s^{-1} **B** 24 m s^{-1} **C** 31 m s^{-1} **D** 190 m s^{-1}

[1 mark]

Question 2

A trolley rolls along a horizontal surface and then travels up a slope before reaching a second horizontal surface. The slope is of length *L*. The trolley has mass *M*. The slope is at an angle *α* to the horizontal surface.

The second horizontal surface is at height *h* above the first surface.



Assume negligible frictional forces. The acceleration of free fall is known.

In order to determine the minimum initial velocity of the trolley for it to reach the top of the slope, which additional values are needed?

A *h* and *M* **B** *M, L* and *h* **C** *α, L* and *M* **D** *h* only

[1 mark]

Question 3

Car X is travelling at half the speed of car Y. Car X has twice the mass of car Y.

Which statement is correct?

A car X has half the kinetic energy of car Y

B car X has one quarter of the kinetic energy of car Y

C car X has twice the kinetic energy of car Y

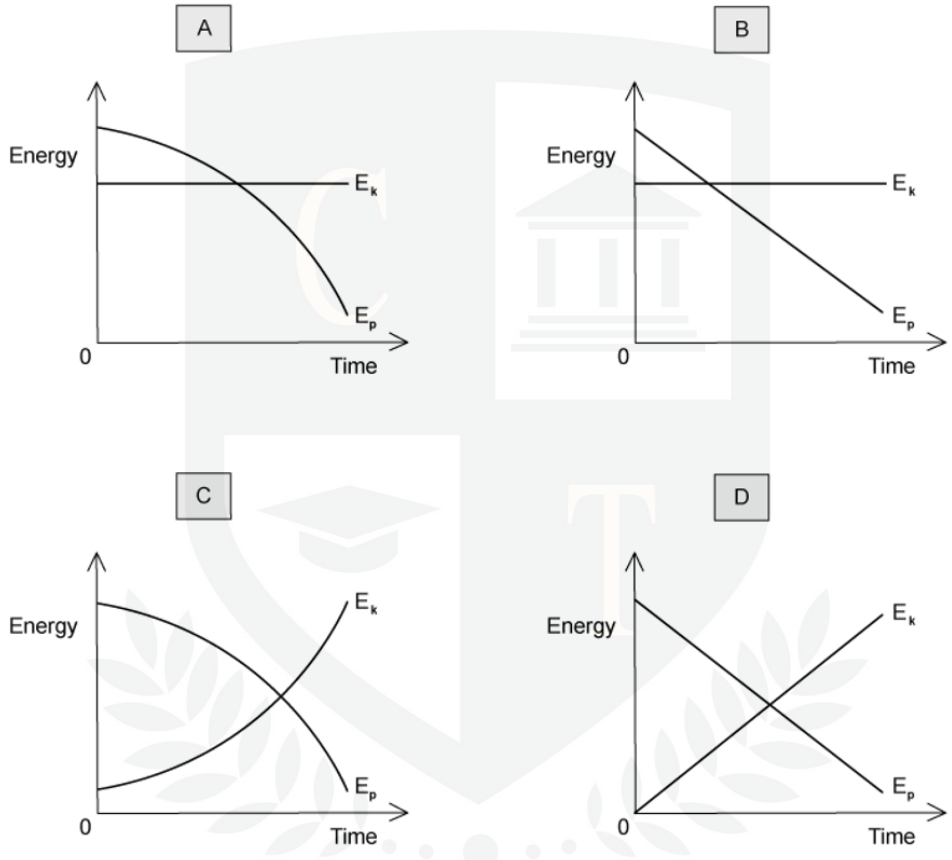
D the two cars have the same kinetic energy

[1 mark]

Question 4

A steel ball is falling at constant speed in oil.

Which graph shows the variation with time of the gravitational potential energy E_p and the kinetic energy E_k of the ball?



[1 mark]

Question 5

A concrete cube of side 0.60 m and uniform density 2.0×10^3 kg m^{-3} is lifted 5.0 m vertically by a crane.

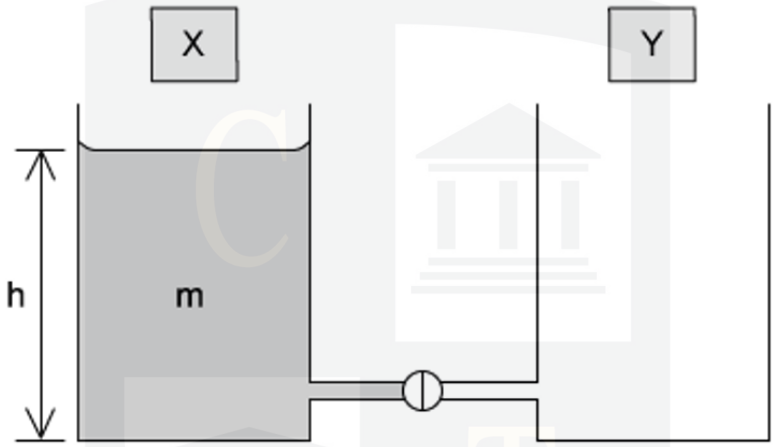
What is the change in potential energy of the cube?

A 0.75 kJ **B** 7.4 kJ **C** 21 kJ **D** 470 kJ

[1 mark]

Question 6

The diagram shows two identical vessels X and Y connected by a short pipe with a tap.



Initially, X is filled with water of mass *m* to a depth *h*, and Y is empty.

When the tap is opened, water flows from X to Y until the depths of water in both vessels are equal.

How much potential energy is lost by the water during this process? (*g* = acceleration of free fall)

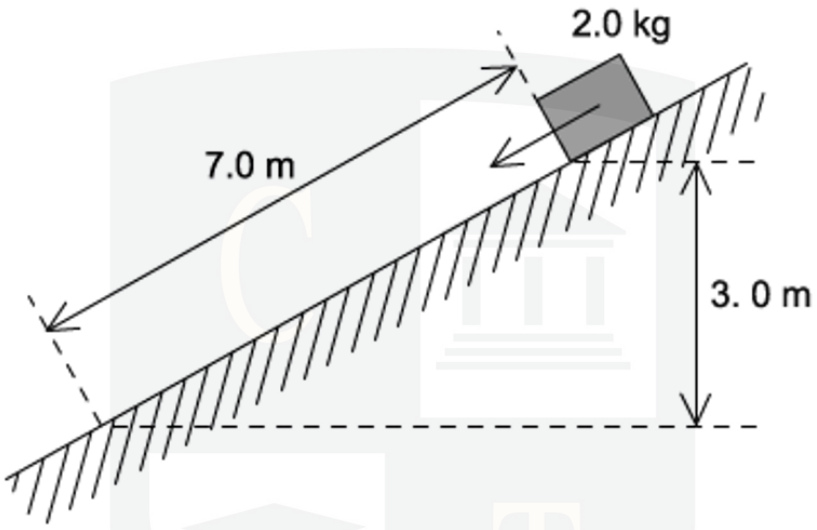
A *0* **B** $\frac{mgh}{4}$ **C** $\frac{mgh}{2}$ **D** mgh

[1 mark]

Question 7

A block of mass 2.0 kg is released from rest on a slope. It travels 7.0 m down the slope and falls a vertical distance of 3.0 m

The block experiences a frictional force parallel to the slope of 5.0 N.



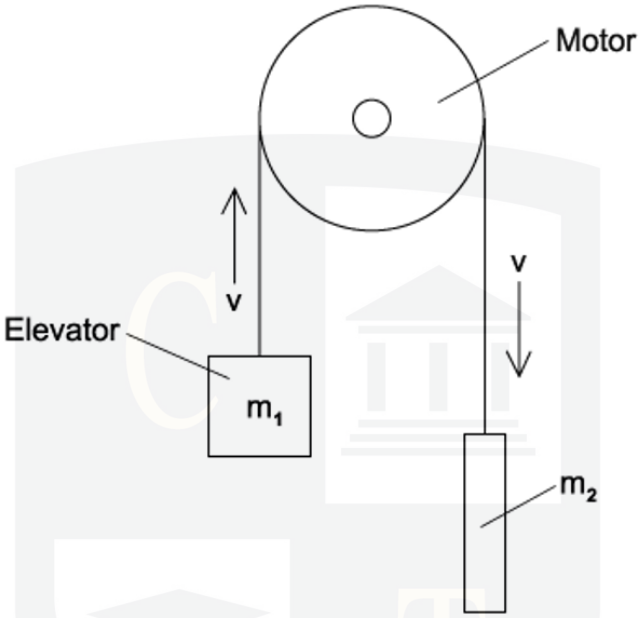
What is the speed of the block after falling this distance?

A 4.9 m s^{-1} **B** 6.6 m s^{-1} **C** 8.6 m s^{-1} **D** 10.1 m s^{-1}

[1 mark]

Question 8

The diagram shows a lift system in which the elevator (mass m_1) is partly counterbalanced by a heavy weight (mass m_2)



At what rate does the motor provide energy to the system when the elevator is rising at a steady speed v? (g = acceleration of free fall)

A $\frac{1}{2}m_1v^2$

B $\frac{1}{2}(m_1 - m_2)v^2$

C m_1gv

D $(m_1 - m_2)gv$

[1 mark]

Question 9

A body travelling with a speed of 20 m s^{-1} has kinetic energy E_k

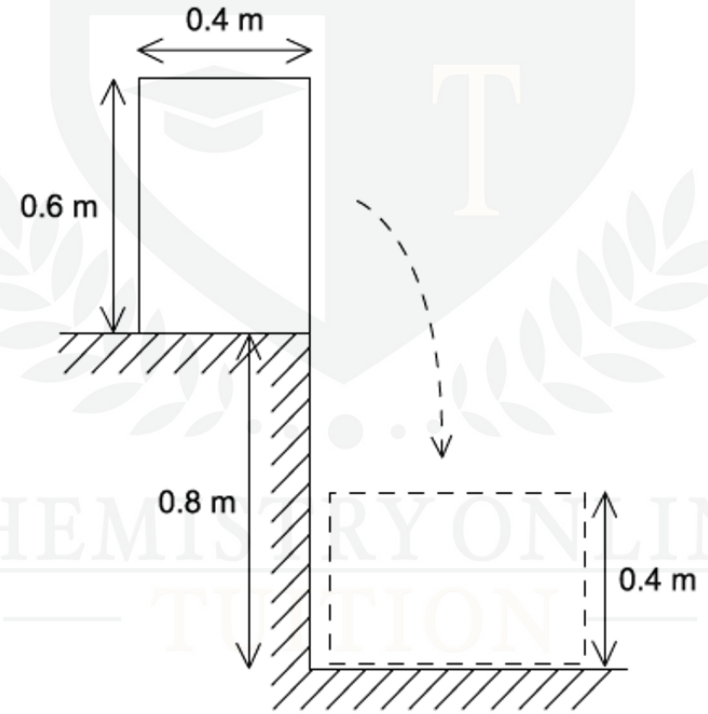
If the speed of the body is increased to 80 m s^{-1}, what is its new kinetic energy?

A $4E_k$ **B** $8E_k$ **C** $12E_k$ **D** $16E_k$

[1 mark]

Question 10

A uniform solid block has weight 500 N, width 0.4 m and height 0.6 m. The block rests on the edge of a step of depth 0.8 m, as shown.



The block is knocked over the edge of the step and rotates through 90° before coming to rest with the 0.6 m edge horizontal.

What is the change in gravitational potential energy of the block?

A 300 J **B** 400 J **C** 450 J **D** 550 J

[1 mark]