

6.1 Energy Conservation

Question Paper

Course	CIE A Level Physics (9702) 2019-2021
Section	6. Work, Energy & Power
Topic	6.1 Energy Conservation
Difficulty	Hard

Time allowed: 10

Score: /5

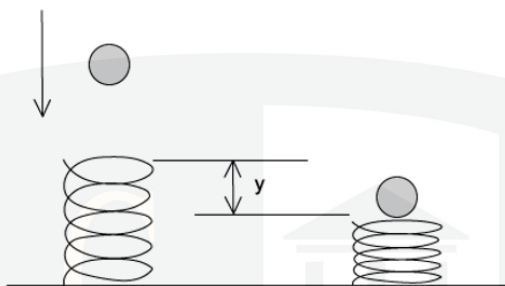
Percentage: /100

CHEMISTRY ONLINE
TUITION

Question 1

A ball of mass m falls freely from rest. When it has reached a speed v , it strikes a vertical spring.

The spring is compressed by a distance y before the ball moves upwards again.



Assume that all energy the ball loses becomes elastic potential energy in the spring.

What is the average force exerted by the spring during its compression?

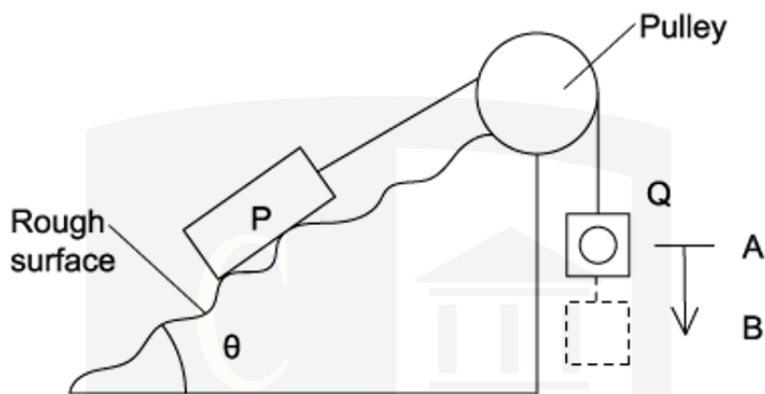
- A $\frac{mv^2}{2y}$
- B $\frac{m}{2y}(v^2 - 2gy)$
- C $\frac{mv^2}{y}$
- D $\frac{m}{2y}(v^2 + 2gy)$

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[1 mark]

Question 2

The figure below shows two blocks P and Q, initially stationary and connected to each other by a taut string passing over a smooth pulley. The system is released from rest and block Q moves vertically downwards from position A to B.



Which of the following statements is correct?

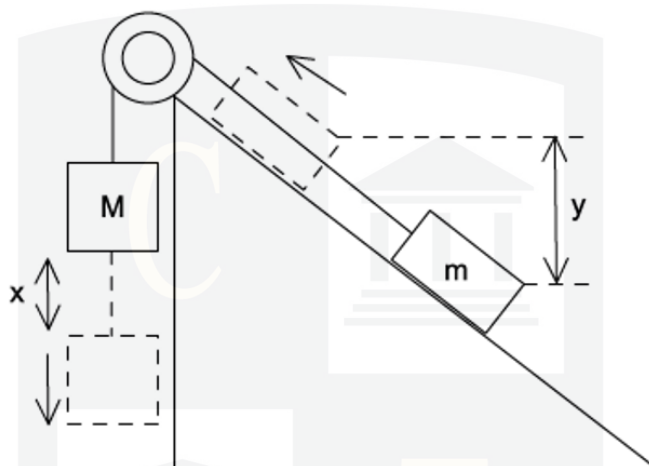
- A** Potential energy of the block Q at A = Kinetic energy of block Q at B
- B** Loss in potential energy of the whole system = Gain in kinetic energy of the whole system + work done against friction due to block P moving against a rough surface
- C** Loss in potential energy of the whole system = Gain in kinetic energy of the system
- D** Loss in potential energy of block Q = Gain in potential energy of block P

[1 mark]

Question 3

The figure shows a mass m on an inclined plane connected by an inextensible string over a smooth pulley to a larger mass M . When the mass M falls through a distance x , the mass m moves up a vertical distance y at a constant speed.

The friction between m and the inclined plane is F .



What amount of energy is converted to heat?

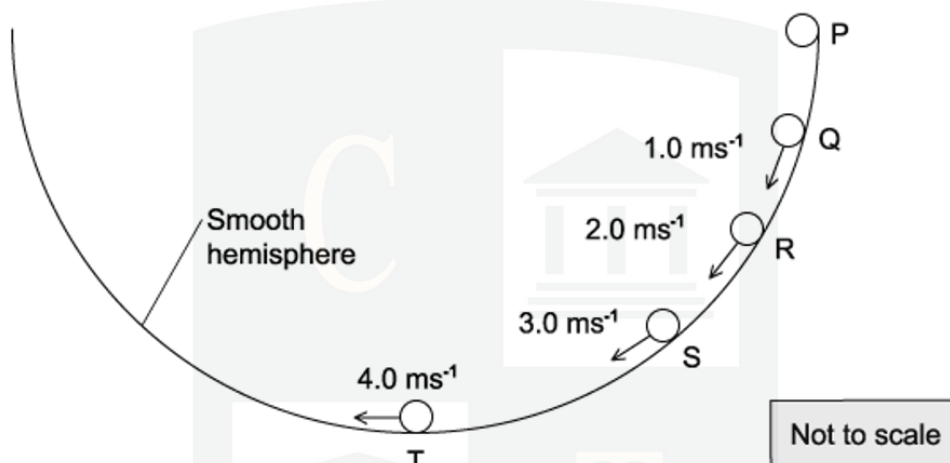
- A $F(x - y)$
- B Fy
- C $Mgx - mgy$
- D $(M - m)gx$

[1 mark]

Question 4

A small mass is placed at point P on the inside surface of a smooth hemisphere. It is then released from rest. When it reaches the lowest point T, its speed is 4.0 m s^{-1} .

The diagram (not to scale) shows the speed of the mass at other points Q, R and S as it slides down. Air resistance is negligible.



The mass loses potential energy E in falling from P to T.

At which point has the mass lost potential energy $\frac{E}{4}$?

- A Q
- B R
- C S
- D none of these

[1 mark]

Question 5

A turbine at a hydroelectric power station is situated 30 m below the level of the surface of a large lake. The water passes through the turbine at a rate of 340 m^3 per minute.

The overall efficiency of the turbine and generator system is 90%.

What is the output power of the power station? (The density of water is 1000 kg m^{-3})

A 0.15 MW

B 1.5 MW

C 1.7 MW

D 90 MW

[1 mark]

