Question

A 10-g bullet of unknown speed is shot horizontally into a 2-kg block of wood suspended from the ceiling by a cord .The bullet hits the block and becomes lodged in it .After the collision ,the block and the bullet swing to a height 30cm above the original position .What was the speed of the bullet?(This device is called the ballistic pendulum).Take g=9.8ms-2

Solution

m = 10 g = 0.01 kg; M = 2 kg;   h = 30 cm = 0.3 m.

The Law of conservation of energy:

$$\frac{mv^2}{2} = (m + M)gh;$$

$$v^2 = 2gh\frac{m + M}{m};$$

$$v = \sqrt{2gh\frac{m + M}{m}} \approx \boldsymbol{34.38\ m/s}$$

Answer: v ≈ 34.38 m/s.

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