

Answer on Question #63332-Physics-Classical Mechanics

A small lead ball, attached to a 1.75-m rope, is being whirled in a circle that lies in the vertical plane. The ball is whirled at a constant rate of three revolutions per second and is released on the upward part of the circular motion when it is 0.88 m above the ground. The ball travels straight upward. In the absence of air resistance, to what maximum height above the ground does the ball rise?

Solution

The maximum height above the ground does the ball rise is

$$h_{max} = h_0 + h$$

We can find h using the conservation of energy principle:

$$\frac{mv^2}{2} = mgh$$

$$h = \frac{v^2}{2g}$$

The initial speed of flight is

$$v = \omega r = 3(2\pi)1.75 \frac{m}{s}$$

$$h_{max} = 0.88 + \frac{(3(2\pi)1.75)^2}{2(9.8)} = 56.40 \text{ m.}$$

Answer: 56.40 m.

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