

Answer on Question #65500, Physics / Mechanics | Relativity

A pendulum bob of mass 50 g is suspended on a string from the ceiling of an elevator which is moving downwards with an acceleration 1.5 ms^{-2} . Draw the free body diagram using the non-inertial frame of reference and determine the tension in the string. (Take $g = 10 \text{ ms}^{-2}$)

Find: $T - ?$

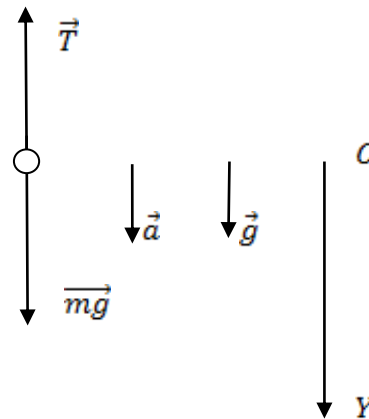
Given:

$$m = 50 \times 10^{-3} \text{ kg}$$

$$a = 1.5 \text{ m/s}^2$$

$$g = 10 \text{ m/s}^2$$

Solution:



Newton's Second Law:

$$\vec{F} = m\vec{a} \quad (1)$$

$$\text{Of (1)} \Rightarrow m\vec{g} + \vec{T} = m\vec{a} \quad (2),$$

where $m\vec{g}$ is gravity force, \vec{T} is tension force

$$\text{Projections on axis OY: } mg - T = ma \quad (3)$$

$$\text{Of (3)} \Rightarrow T = m(g - a) \quad (4)$$

$$\text{Of (4)} \Rightarrow T = 0.425 \text{ N}$$

Answer:

0.425 N