

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 ms⁻²)

Find: T – ?

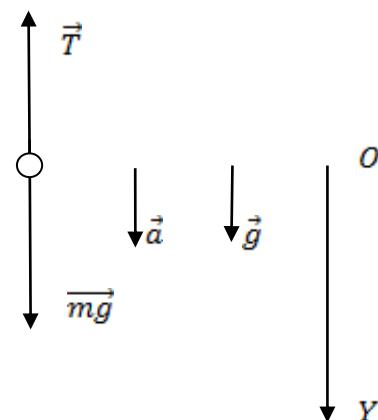
Given:

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

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

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

Solution:



Newton's Second Law:

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

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

where \vec{mg} is gravity force, \vec{T} is tension force

Projections on axis OY: $mg - T = ma$ (3)

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

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

Answer:

$$0.425 \text{ N}$$