Answer on Question #73055, Physics / Electric Circuits

A straight conductor carrying current of $I = 2.45$ ampere floats horizontal in air in uniform magnetic field of induction $B = 4 \times 10^{-4}$ Wb/metre square field is horizontal at right angle to length of conductor. If conductor has linear density of $\tau = 0.1$ g/m. Find the acceleration due to gravity at that place.

Solution:

The Newton's second law gives

$$ma = mg - F_{\text{A}}$$

where $F_{\text{A}} = BIl$ is the Ampere's force.

Thus

$$a = g - \frac{F_{\text{A}}}{m} = g - \frac{BIl}{m} = g - \frac{BI}{\tau}$$

$$a = 9.8 - \frac{4 \times 10^{-4} \times 2.45}{0.0001} = 0 \text{ m/s}^2$$

Answer: 0 m/s^2