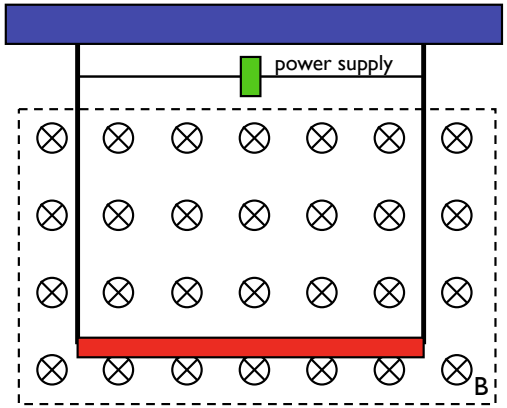
Problem 19.20

A conductor suspended by two flexible wire has a mass per unit length of .04 kg/m. What current is required (and in what direction must the current flow) to support the conductor in equilibrium if the magnetic field strength is 3.6 Teslas?



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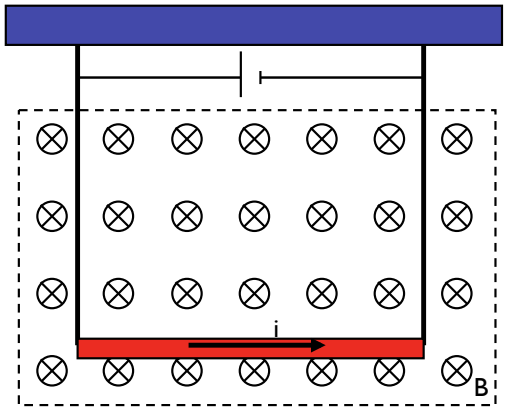

The current must flow such that iLxB yields a force upward. Using the right-hand rule, that direction must be as shown. As for the math:

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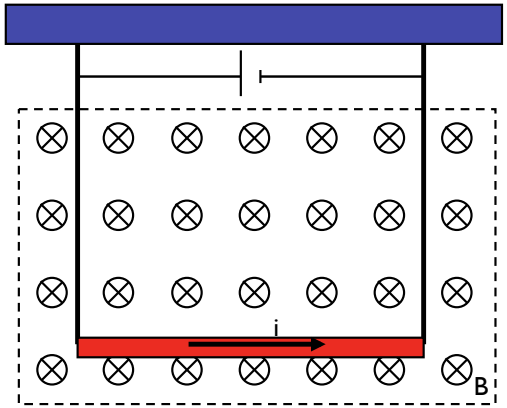

$$\sum F_y:$$

$$iLB\sin\theta - mg = ma_y$$

$$iL(3.6\text{ T})\sin 90^\circ = \left[(.04\text{ kg/m})L\right](9.8\text{ m/s}^2)$$

$$i = \frac{(.04\text{ kg/m})(9.8\text{ m/s}^2)}{(3.6\text{ T})}$$

$$i = .109\text{ amps}$$