Quiz 8b

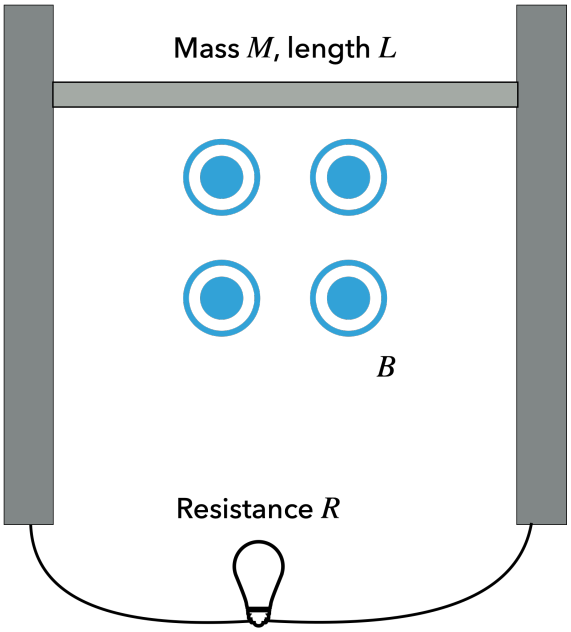
The following information may or may not be of use:

$$\text{Lorentz Force Law: } \vec{F} = q\left(\vec{E} + \vec{v} \times \vec{B}\right)$$

$$\text{Electrical Power: } P = I\Delta V$$

In a region of space there is a uniform magnetic field with magnitude $\left|\vec{B}\right| = 5$ T pointing out of the page. A neutral metal bar of length $L = 0.2$ m and mass $M = 200$ g falls downward with no friction while maintaining good electrical contact with two vertical conducting rails. The conducting rails are connected through a light bulb with a 240 Ω resistance.

Note: The apparatus is on the surface of the Earth; you may assume that the gravitational acceleration of Earth $|\vec{g}| = 9.8\ \frac{\text{N}}{\text{kg}}$ is constant throughout the region.



1. What is the maximum speed of the metal bar?
2. How much power is dissipated through the light bulb once the bar reaches its maximum speed?
3. What direction is the conventional current flowing through the light bulb as the bar travels with maximum speed? (Indicate on the diagram)