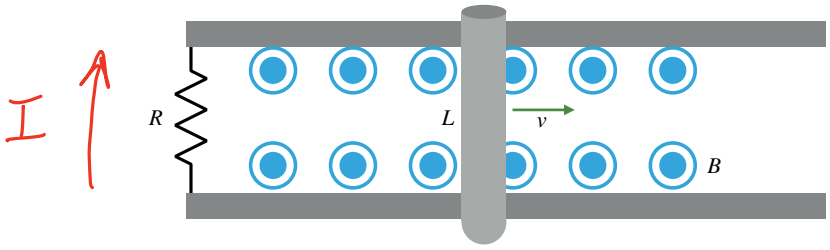
Quiz 8

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 slides horizontally with speed $|\vec{v}| = 500\ \frac{\text{m}}{\text{s}}$ across two fixed conducting rails with negligible friction but good electrical contact. The two metal rails are connected by a resistor with resistance $R = 220\ \Omega$.



1. What direction is current flowing through the resistor? Indicate by drawing an arrow on the diagram.

2. At this instant, what is the power dissipated in the resistor?

$\mathcal{E} = BLv$

$P = I\mathcal{E} = \dfrac{\mathcal{E}^2}{R}$

$R = 220\ \Omega$

$\mathcal{E} = (5\text{ T})(0.2\text{ m})\left(500\ \frac{\text{m}}{\text{s}}\right) = 500\text{ V}$

$P = \dfrac{(500\text{ V})^2}{220\ \Omega} = 1136\text{ W}$

3. The speed of the metal bar will _____ with time.

   (a) Increase
   (b) Remain constant
   (c) Decrease