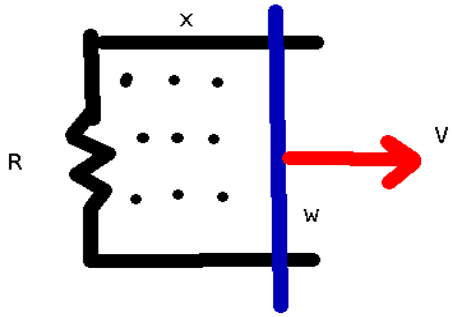
Physics 220: Unquiz 06

A bar of width w is on conducting rails with a resistance R. A magnetic field B is directed outward as shown. The bar has an instantaneous position given by:
$x = x_0 + vt$ where v is a positive constant with dimensions of [L]/[t].

(a) does the induced current circulate clockwise or counterclockwise?
(b) Find the magnitude of the induced emf
(c) find the magnitude of the induced current.



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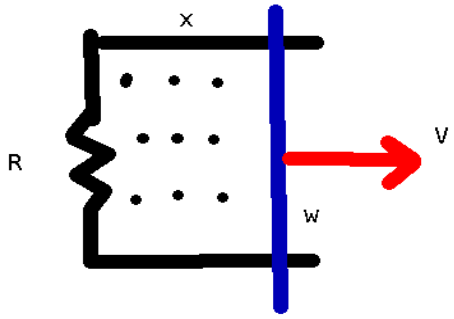

The current circulates clockwise.

$$\text{emf} = \frac{-\Delta\phi}{\Delta t} : \phi = \sum_{\Delta A_i} \vec{B}_i \cdot \Delta \vec{A}_i = B \sum \Delta A_i = B W \left(x_0 + vt \right) : \frac{\Delta\phi}{\Delta t} = BVW$$

$$\Rightarrow \text{emf} = -BVW \Rightarrow |\text{emf}| = BVW$$

$$\text{emf} = IR \Rightarrow I = \frac{\text{emf}}{R} = \frac{BVW}{R}$$