Induced voltage: $\mathcal{E} = -\dfrac{d\Phi_B}{dt}$; $\mathcal{E} = -N\dfrac{d\Phi_B}{dt}$

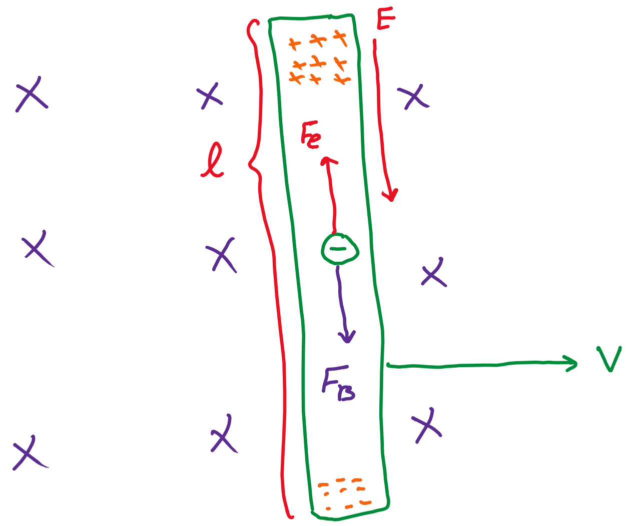
$$= -\frac{d[BA\cos\theta]}{dt}$$

$F_B = qVB$

$F_e = qE$

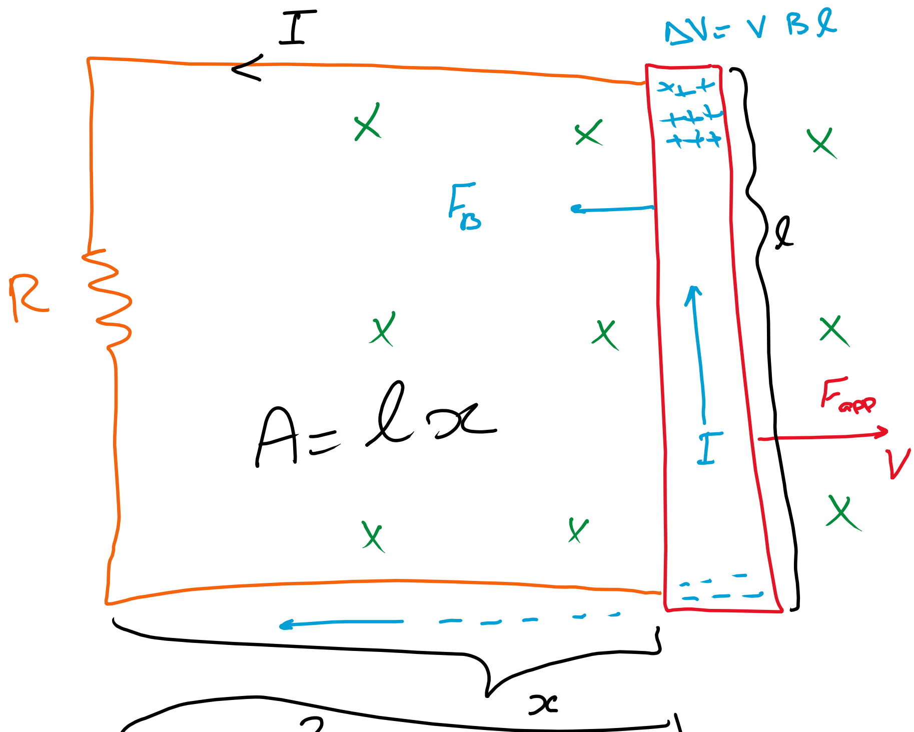
$F_e = F_B \Rightarrow qE = qVB.$

$\Rightarrow \boxed{E = VB}$ equilibrium



$E = \dfrac{\Delta V}{\ell} \Rightarrow \Delta V = E\ell = VB\ell$

$I = \dfrac{\Delta V}{R} = \dfrac{VB\ell}{R}$



$$\mathcal{E} = -\frac{d\Phi_B}{dt}$$

$$= -\frac{d[BA\cos\theta]}{dt}$$

$$= -B\frac{dA}{dt} = -B\ell\frac{dx}{dt}$$

$$\boxed{\mathcal{E} = -B\ell v}$$

motional emf

$$\boxed{P = \frac{\mathcal{E}^2}{R} = F_{app}\, v}$$

$F_{app} = F_B = I\ell B$

$\theta =$

$$\varepsilon = -N\frac{d\Phi_B}{dt} = -NBA\frac{d[\cos\theta]}{dt}$$

$\omega = rad/sec = \frac{\theta}{t}$

$$= -NBA\frac{d[\cos\omega t]}{dt}$$

$\theta = \omega t$

$$= -NBA[-\sin\omega t \cdot \omega]$$

$$\boxed{\varepsilon = NBA\omega\sin\omega t}$$

$$\boxed{\varepsilon_{max} = NBA\omega}$$