Practico 6 ej. 11

a) $|\mathcal{E}| = \left|\frac{d\Phi}{dt}\right| = \frac{B\,dS}{dt} = Ba\frac{dx}{dt} = Ba\,v$

$|\mathcal{E}| = iR \qquad R = \rho\frac{l}{A} = \rho\frac{2q}{A} + \rho\frac{2x}{A} = \frac{2\rho}{A}(a+x)$

$|\mathcal{E}| = \frac{dq}{dt}\frac{2\rho}{A}(a+x) = Ba\,v \qquad \frac{dq}{dt} = \frac{dq}{dx}\frac{dx}{dt} = \frac{dq}{dx}v$

$\Rightarrow \frac{dq}{dx}v\frac{2\rho}{A}(a+x) = Ba\,v \Rightarrow \boxed{\frac{dq}{dx} = \frac{BaA}{2\rho(a+x)}}$

b) $q(x) = \int_0^x \frac{BaA\,dx}{2\rho(a+x)} = \frac{BaA}{2\rho}\int_0^x \frac{dx}{a+x}$

$q(x) = \frac{BaA}{2\rho}\ln\left(1+\frac{x}{a}\right) \Rightarrow \boxed{q_{TOT} = \frac{BaA}{2\rho}\ln\left(1+\frac{L}{a}\right)}$

c) $F = m\frac{dv}{dt} = -Bai = -Ba\frac{dq}{dt}$

$\frac{dv}{dt} = \frac{dv}{dq}\frac{dq}{dt} \Rightarrow m\frac{dv}{dq}\frac{dq}{dt} = -Ba\frac{dq}{dt} \Rightarrow$

$\frac{dv}{dq} = -\frac{Bq}{m} \Rightarrow mv - mv_0 = -Baq \Rightarrow$

$mv(x) = mv_0 - Baq(x) \Rightarrow \boxed{v(x) = v_0 - \frac{B^2a^2A}{2\rho}\ln\left(1+\frac{x}{a}\right)}$