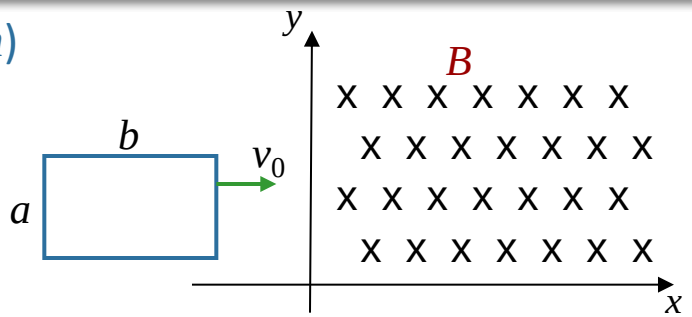
Follow Up

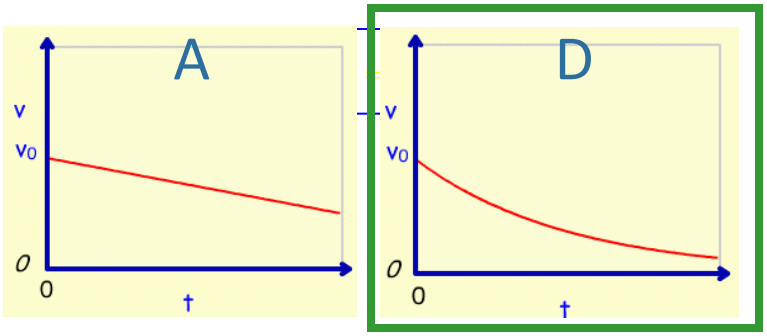
A rectangular loop (sides $= a,b$, resistance $= R$, mass $= m$) coasts with a constant velocity v_0 in $+x$ direction as shown. At $t = 0$, the loop enters a region of constant magnetic field B directed in the $-z$ direction.



What is the velocity of the loop when half of it is in the field?

$$\varepsilon = Bav_0$$

Which of these plots best represents the velocity as a function of time as the loop moves form entering the field to halfway through ?



Why D, not A?

F is not constant, depends on v

$$F = -\frac{a^2B^2v}{R} = m\frac{dv}{dt} \quad \rightarrow \quad v = v_o e^{-\alpha t}$$

where $\alpha = \dfrac{a^2B^2}{mR}$

Challenge: Look at energy →

Claim: The decrease in kinetic energy of loop is equal to the energy dissipated as heat in the resistor. Can you verify?