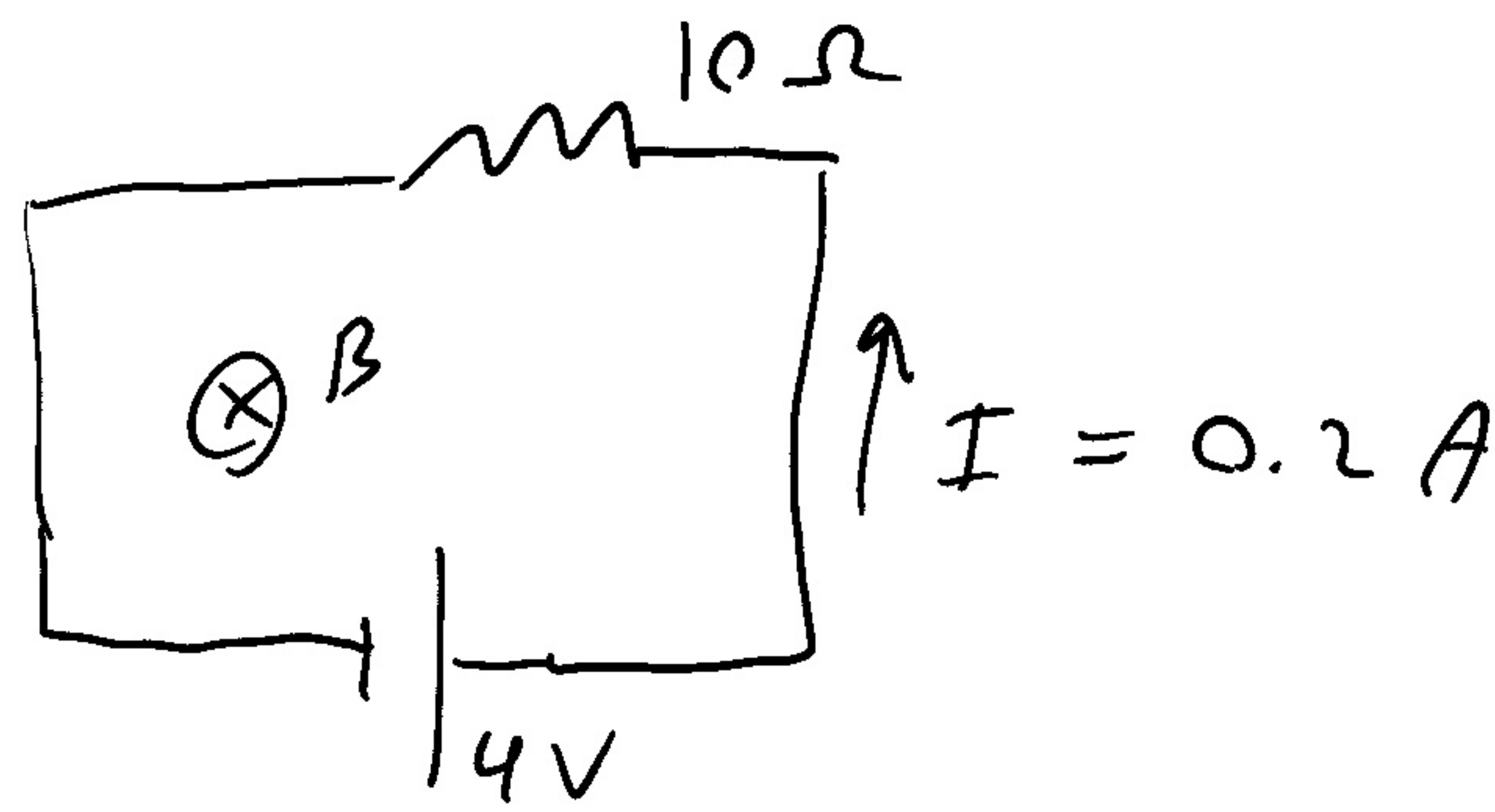
Q1.



$$I = (4 + \mathcal{E})/10 = 0.2$$

$$\Rightarrow \mathcal{E} = -2\,V \quad CW$$

$$= -d\phi_B/dt = -d/dt\,(B \cdot L^2)$$

$$= -L^2\, dB/dt$$

$$\Rightarrow dB/dt = 2/L^2$$

B decreasing

Q2: source term involving magnetic monopole "charge" in eq. II

source term involving motion of monopoles in eq. III

Q3. a. $V_R = V_L = V_C = \mathcal{E}_m \sin \omega t$

b. $I_R = V_R/R = \mathcal{E}_m/R \sin \omega t$

c. $V_L = L\, dI/dt$

$\Rightarrow I_L = -\mathcal{E}_m/\omega L \cos \omega t$

$= -\mathcal{E}_m/X_L \cos \omega t$

d. $V_C = Q/C$

$\Rightarrow Q = C\mathcal{E}_m \sin \omega t$

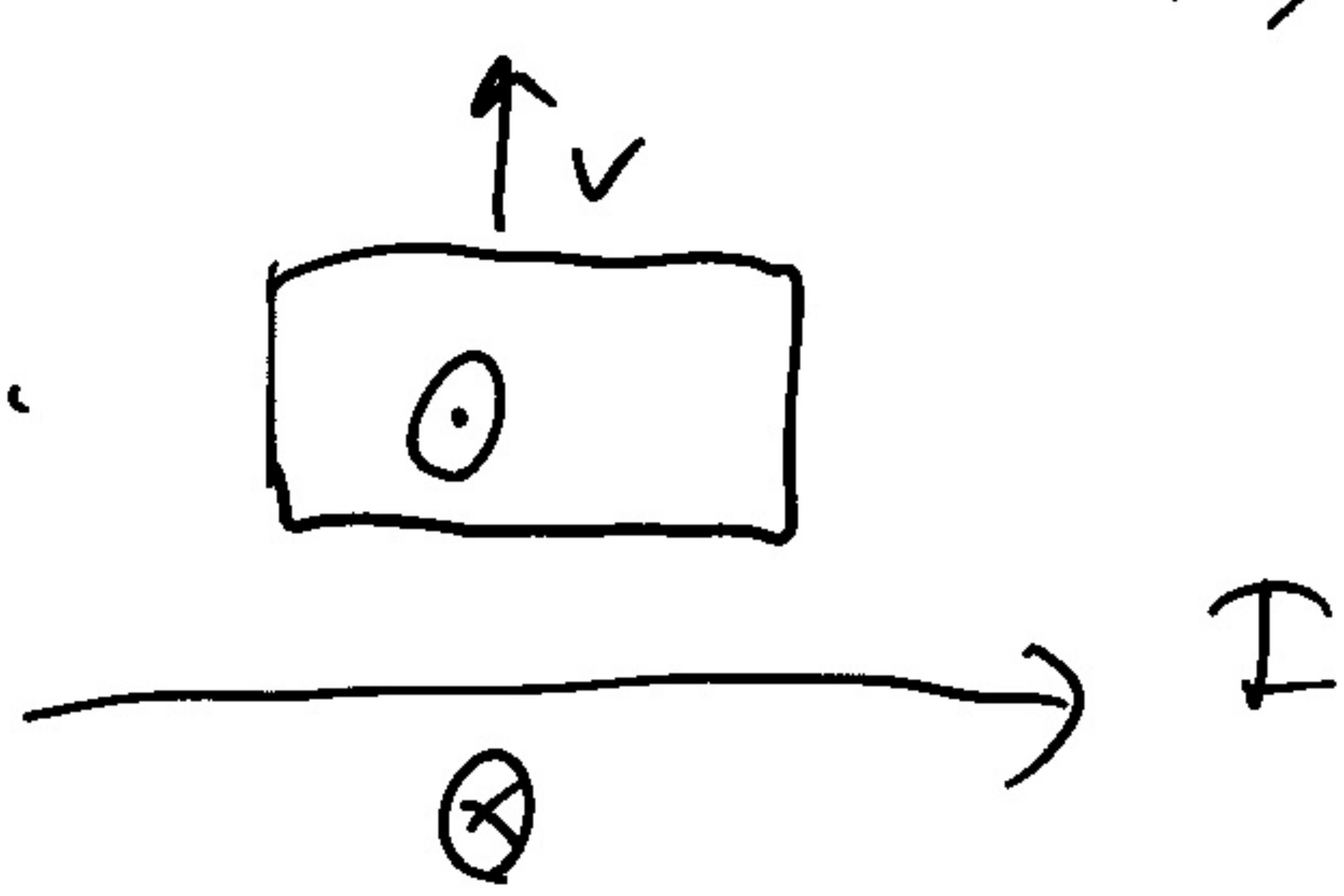
$\Rightarrow I_C = \omega C \mathcal{E}_m \cos \omega t$

$= \mathcal{E}_m/X_C \cos \omega t$

e. $I_s = I_R + I_L + I_C$

$I_m \sin(\omega t - \varphi) = \mathcal{E}_m (1/R \sin \omega t + 1/X_C \cos \omega t - 1/X_L \cos \omega t)$

Q4. a.



$\varphi_B = \int \vec{B} \cdot d\vec{A}$ decreasing

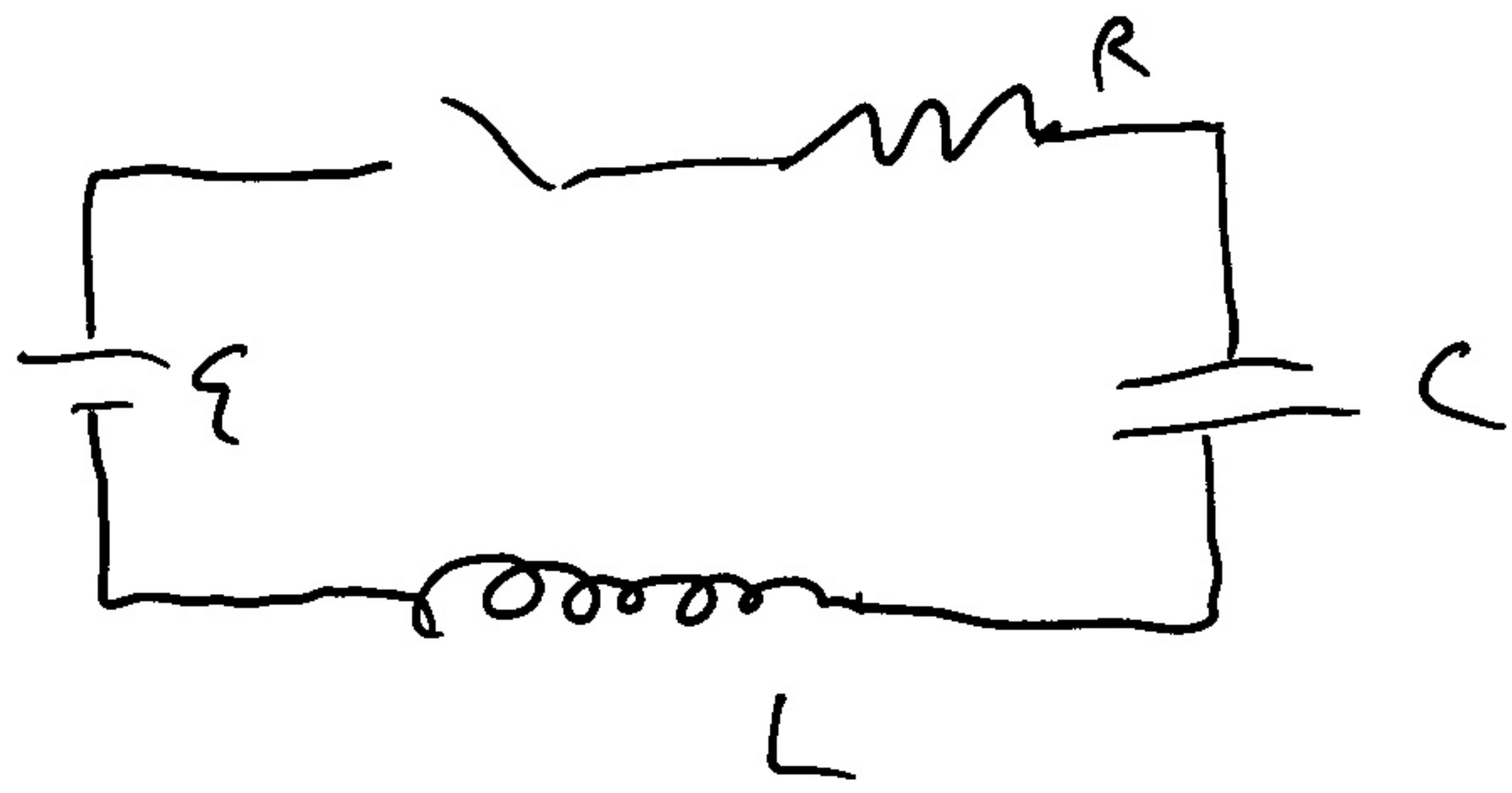
$\Rightarrow \mathcal{E}$ CCW

to oppose change

b. $F = I\vec{L} \times \vec{B}$

Net force pulls loop back toward wire.

Q 5.



ⓐ $t = 0$

$V_R = 0$

$V_C = 0$

$V_L = \varepsilon$

All voltage across inductor

ⓑ $t = \infty$

$V_R = 0$

$V_C = \varepsilon$

$V_L = 0$

All voltage across capacitor