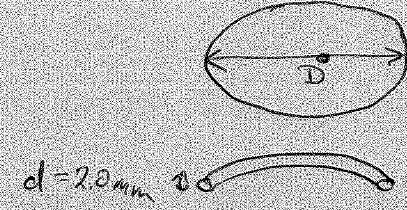
Ch. 13 Prob. 32

$D = 10.0\,cm$

$B_0 = 0.50\,T$

$B_f = 0\,T$



$$A = \pi r^2 = \frac{\pi D^2}{4} = \frac{\pi (0.10\,m)^2}{4} = 7.85 \times 10^{-3}\ m^2$$

Now $$\mathcal{E} = -A\frac{dB}{dt} = -\frac{(7.85 \times 10^{-3}\,m^2)(0 - 0.50\,T)}{\Delta t}$$

$$\mathcal{E} = \frac{3.93 \times 10^{-3}\ m^2 T}{\Delta t}$$

The resistance of the loop is

$\rho = 1.68 \times 10^{-8}\,\Omega \cdot m$
(see page 398)

$$R = \rho\frac{L}{A} = \rho\frac{(\pi D)}{\left(\frac{\pi d^2}{4}\right)} = \frac{4\rho D}{d^2}$$

$$= \frac{4(1.68 \times 10^{-8}\,\Omega \cdot m)(0.10\,m)}{(2.0 \times 10^{-3})^2}$$

$$= 1.68 \times 10^{-3}\,\Omega$$

Current while the B-field changes

$$\mathcal{E} = I \cdot R \rightarrow I = \frac{\mathcal{E}}{R} = \frac{\frac{3.93 \times 10^{-3}\ m^2 T}{\Delta t}}{1.68 \times 10^{-3}\,\Omega}$$

$$I = \frac{2.34}{\Delta t}\frac{m^2 T}{\Omega}$$

However $$I = \frac{\Delta Q}{\Delta t}$$

so $$\frac{2.34\,\frac{m^2 T}{\Omega}}{\Delta t} = \frac{\Delta Q}{\Delta t}$$

$\therefore$ $\boxed{\Delta Q = 2.34\,C}$