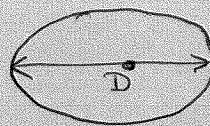


Ch. 13 Prob. 32

$$D = 10.0 \text{ cm}$$

$$B_0 = 0.50 \text{ T}$$

$$B_f = 0 \text{ T}$$



$$d = 2.0 \text{ mm}$$
A hand-drawn diagram of a curved wire segment. A small circle at the center of the curve is labeled with the letter 'd'.

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

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

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

The resistance of the loop is

$$\rho = 1.68 \times 10^{-8} \Omega \cdot \text{m}$$

(see page 398)

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

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

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

Current while the B-field changes

$$\mathcal{E} = I \cdot R \rightarrow I = \frac{\mathcal{E}}{R} = \frac{3.93 \times 10^{-3} \text{ m}^2 \text{ T}}{\Delta t} \cdot \frac{1}{1.68 \times 10^{-3} \Omega}$$

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

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

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

$$\therefore \Delta Q = 2.34 \text{ C}$$