33.30. Model: Assume that the field is uniform in space over the coil.
Visualize: We want an induced current so there must be an induced emf created by a changing flux.
Solve: To relate the emf and the current we need to know the resistance. From Equation 31.3,

$$R = \frac{\rho_{\text{Cu}} l_{\text{wire}}}{A_{\text{wire}}} = \frac{\rho_{\text{Cu}} N 2\pi r}{\pi r_{\text{wire}}^2} = \frac{2(100)(1.7\times10^{-8}\ \Omega\ \text{m})(0.040\ \text{m})}{(2.5\times10^{-4}\ \text{m})^2} = 2.18\ \Omega$$

The magnetic field is perpendicular to the plane of the coil so the flux for a single loop of the coil is $\Phi = \vec{A}\cdot\vec{B} = BA$, if we take the normal to the coil to be in the same direction as the field. Using Faraday's law,

$$\mathcal{E} = IR = NA\left|\frac{dB}{dt}\right| = N\pi r^2\left|\frac{dB}{dt}\right| \Rightarrow \left|\frac{dB}{dt}\right| = \frac{IR}{N\pi r^2} = \frac{(2.0\ \text{A})(2.18\Omega)}{100\pi(0.040\ \text{m})^2} = 8.67\ \text{T / s}$$