

$$m_e = 9.11 \times 10^{-31} \text{ kg} \quad E_k = 3.3 \times 10^{-19} \text{ J}$$

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$$1) a) E_k = \frac{1}{2} m v^2 \Rightarrow v = \sqrt{\frac{2E_k}{m}}$$

$$v = \sqrt{\frac{2(3.3 \times 10^{-19} \text{ J})}{9.11 \times 10^{-31} \text{ kg}}} = 8.5 \times 10^5 \text{ m/s}$$

$$b) \quad qVB = \frac{m v^2}{r} \Rightarrow r = \frac{m v^2}{qVB} \Rightarrow r = \frac{m v}{qB}$$

$$r = \frac{(9.11 \times 10^{-31} \text{ kg})(8.5 \times 10^5 \text{ m/s})}{(1.6 \times 10^{-19} \text{ C})(.235 \text{ T})} = 2.06 \times 10^{-5} \text{ m}$$

$$2) \quad d_s = 10 \text{ cm} = .1 \text{ m} \quad L_s = 75 \text{ cm} = .75 \text{ m}$$

$$d_c = ? \text{ if } .1 \text{ cm} = .001 \text{ cm} \quad \rho_{\text{Cu}} = 1.7 \times 10^{-8} \Omega \text{ m}$$

$$B = 8 \text{ mT} = 8 \times 10^{-3} \text{ T}$$

$$N = \frac{L_s}{d_c} = \frac{.75 \text{ m}}{.001 \text{ m}} = 750 \text{ turns}$$

$$L_c = (2\pi r)(N) = 2\pi\left(\frac{d_s}{2}\right)N = (\pi d_s)N$$

$$= (.1 \text{ m})\pi(750) = 75\pi \text{ m}$$

$$R = \frac{\rho L}{A} = \frac{(1.7 \times 10^{-8} \Omega \text{ m})(75\pi \text{ m})}{2\pi(.0005)^2} = 5.1 \Omega$$

$$B = \mu_0 n I \Rightarrow B = \frac{\mu_0 N I}{L} \Rightarrow I = \frac{BL}{\mu_0 N}$$

$$= \frac{(8 \times 10^{-3} \text{ T})(.75 \text{ m})}{(4\pi \times 10^{-7} \frac{\text{T m}}{\text{A}})(750)} = 6.4 \text{ A}$$

$$P_s = I^2 R = (6.4 \text{ A})^2 (5.1 \Omega) = 208.9 \text{ W}$$