(a) Calculate the cyclotron frequency (in Hz) for electrons in a magnetic field of 1.75 T.

\[ f = \frac{eB}{m} = \frac{(1.6 \times 10^{-19} \text{ C}) 	imes (1.75 \text{ T})}{(9.1 	imes 10^{-31} \text{ kg})} = 4.89 \times 10^{10} \text{ Hz} \]

(b) A galvanometer is built with a plane circular coil of radius 3.75 cm and 750 turns of wire. If the magnetic field is in the plane of the coil, calculate the torque (in N\(\text{m}\)) for a current of 175 milliamperes and a field of 0.450 T.

\[ \tau = nIAB = 750 \times 0.175 \times 0.00375 \times 0.450 = 0.261 \text{ N}\text{m} \]

(c) Determine the drift velocity for electrons in a round copper wire of radius 0.75 mm. The current is 15.0 A, the wire is 6.00 m long, the density of copper is 8.50 grams/cc. The atomic mass of copper is 65.0.

\[ v = \frac{I}{enA} = 15 \times 10^{-6} \times \frac{8.5 \times 10^{-6} \text{ g/cm}}{65 \text{ g/mol}} = 0.674 \text{ m/s} \]

(d) A 12.0 volt battery has an internal resistance of 1.50 \(\Omega\). What is the power it can deliver to a load of 1.00 \(\Omega\)?

\[ P = I^2R = \left(\frac{E}{R+r}\right)^2 \cdot R = \left(\frac{12}{1.5+1.0}\right)^2 \cdot 1.0 = 23 \text{ W} \]

(e) If the earth's magnetic field is \(1.00 \times 10^{-4} \text{ T}\), calculate the force on 10.0 m of wire which is perpendicular to the field and carries a current of 1.750 A.

\[ F = BIL = 10^{-4} \times 1.75 \times 10 = 1.75 \text{ N} \]