

42. We find N , the number of turns of the solenoid, from $B = \mu_0 in = \mu_0 iN/\ell$: $N = B\ell/\mu_0 i$. Thus, the total length of wire used in making the solenoid is

$$2\pi rN = \frac{2\pi rB\ell}{\mu_0 i} = \frac{2\pi(2.60 \times 10^{-2} \text{ m})(23.0 \times 10^{-3} \text{ T})(1.30 \text{ m})}{2(4\pi \times 10^{-7} \text{ T}\cdot\text{m/A})(18.0 \text{ A})} = 108 \text{ m} .$$