

## EXAMPLE 1-5

Design a 100 nH ( $0.1 \mu\text{H}$ ) air-core inductor on a  $\frac{1}{4}$ -inch ( $0.635 \text{ cm}$ ) coil form.

### Solution

For optimum Q, the length of the coil should be equal to its diameter. Thus,  $l = 0.635 \text{ cm}$ ,  $r = 0.317 \text{ cm}$ , and  $L = 0.1 \mu\text{H}$ .

Using Equation 1-8 and solving for N gives:

$$N = \sqrt{\frac{29L}{0.394r}}$$

where we have taken  $l = 2r$ , for optimum Q.

Substituting and solving:

$$\begin{aligned} N &= \sqrt{\frac{29(0.1)}{(0.394)(0.317)}} \\ &= 4.8 \text{ turns} \end{aligned}$$

Thus, we need 4.8 turns of wire within a length of 0.635 cm. A look at Table 1-1 reveals that the largest diameter enamel-coated wire that will allow 4.8 turns in a length of 0.635 cm is No. 18 AWG wire which has a diameter of 42.4 mils ( $0.107 \text{ cm}$ ).