## Question.

What is the self-inductance of an air-core solenoid, 1m long and 0.05m in diameter, if it has 1400 turns?

Given:

$\mu = 1$

$l = 1\,m$

$d = 0.05\,m$

$N = 1400$

Find:

$L = ?$

## Solution.

By definition the self-inductance of a solenoid with core is:

$$L = \frac{\mu N^2 A}{l}$$

In our case, we don't have the core. Therefore, $\mu = 1$. And the cross-sectional area is equal to:

$$A = \frac{\pi d^2}{4}$$

Finally, we receive:

$$L = \frac{\pi d^2 N^2}{4l}$$

Calculate:

$$L = \frac{3.14 \cdot 0.05^2 \cdot 1400^2}{4} = 3846.5\,H$$

## Answer.

$L = \dfrac{\pi d^2 N^2}{4l} = 3846.5\,H$