Answer on Question #45667, Physics, Other

One end of a simple rectangular wire-loop current balance is inserted into a solenoid. A force of 3.0×10^{-3} N is found to act on this end when a current of 2.0A is flowing in it. If the length of the conductor forming the end of the wire-loop is 0.10m, what is the magnetic flux density in the solenoid?

a. 0.043T

b. 0.26T

c. 0.43T

d. 0.015T

Solution:

The force on the current-carrying conductor in a magnetic field depends upon:

(a) the flux density of the field, B teslas

(b) the strength of the current, I amperes,

(c) the length of the conductor perpendicular to the magnetic field, *l* metres, and

(d) the directions of the field and the current.

When the magnetic field, the current and the conductor are mutually at right angles then the force is:

$$F = BIl$$

Thus,

$$B = \frac{F}{Il}$$

In our case:

$F = 3 \cdot 10^{-3}$ N,

$I = 2.0$ A,

$l = 0.10$ m

Thus,

$$B = \frac{3 \cdot 10^{-3}}{2.0 \cdot 0.10} = 0.015 \text{ T}$$

Answer: d. 0.015T