Answer on Question#61360 – Physics – Electromagnetism

5) A 0.96H coil carries a current of 8.0A. Calculate the energy stored in it

a) 30.7J

b) 45.3J

c) 62.6J

d) 27.3J

Solution. When a electric current is flowing in an inductor, there is energy stored in the magnetic field. Find energy using formula $E = \frac{L \cdot I^2}{2}$, where L – inductor, I – current.

$E = \frac{0.96 \cdot 8^2}{2} = 30.72J.$

Answer. a) 30.7J.

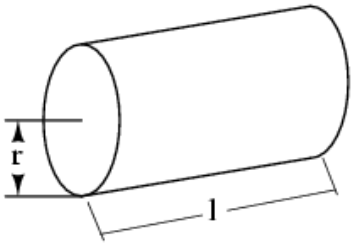
6) A 1000-turn solenoid of length 20cm has a cross-sectional area of 2.0 square centimetre. Find the inductance of the coil if the core is air.

a) 1:26Â10À3 H

b) 2:30Â10À3 H

c) 4:66Â10À3 H

d) $1.54\times10^{-3}H



Solution. We can find inductance of the coil using formula

$$L = \frac{N^2 \mu A}{l}, \mu = \mu_r \mu_0$$

Where

L – inductance of coil in Henrys

N – number of turns in wire coil

μ – permeability of core material (absolute)

μ_r – relative permeability, dimensionless (1 for air)

$\mu_0 = 4\pi \cdot 10^{-7} \frac{Tm}{A}$ – permeability of free space

A – area of coil in square meters

l – length of coil in meters

According to the condition of the problem $\mathrm{T} = 1000$, $A = 2cm^2 = 2 \cdot 10^{-4} m^2$, $l = 20cm = 0.2m$.

Hence $L = \frac{1000^2 \cdot 4\pi \cdot 10^{-7} \cdot 2 \cdot 10^{-4}}{0.2} = 1.26 \cdot 10^{-3} H$

Answer. a) $1.26 \cdot 10^{-3} H$.