

Find study resources

[Science](#) / [Physics](#) / TOPIC: MAGNETISM 3. A circular coil o...**✔ This question has been answered**[Add to library](#)**Question**

TOPIC: MAGNETISM

3. A circular coil of wire of 3,000 turns and diameter

6.0 cm is situated in magnetic

field so that the major plane of the coil is normal to the field. If the flux density in the coil changes uniformly from 0.5 to 1.7 Wb/m² in 3.14 min, what emf is induced in the coil?

4. An inductive coil has a resistance of 9.50 Ω. A battery of 115 V is suddenly connected to the coil. After the current has risen to 10.0 A, it is changing at the rate of 160 A/s. what is the self-inductance of the coil?

Answered by Expert Tutors

3) $e = 5.41 \times 10^{-2} \text{ volts}$

4) $L = 0.719 \text{ Henry}$

Step-by-step explanation

3)

No of turns, $N = 3000$ Circular coil diameter, $d = 6 \text{ cm}$ Thus, radius, $r = d/2 = 3 \text{ cm} = 0.03 \text{ m}$.Now, area of the coil, $A = \pi r^2 = \pi \times (0.03)^2 = 2.83 \times 10^{-3} \text{ m}^2$ Flux density changes by $\Delta B = 1.7 - 0.5 = 1.2 \text{ wb/m}^2 = 1.2 \text{ wb/m}^2$ in time $\Delta t = 3.14 \text{ min} = 3.14 \times 60 = 188.4 \text{ s}$

So, the induced emf is given by,

$$e = NA \frac{\Delta B}{\Delta t} = \frac{3000 \times 2.83 \times 10^{-3} \times 1.2}{188.4} = 5.41 \times 10^{-2} \text{ volts (Answer).}$$

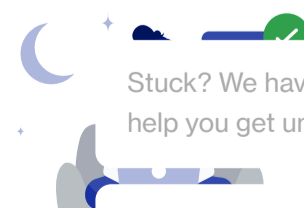
4) Given, Battery voltage, $v = 115 \text{ V}$ Current change, $\frac{dI}{dt} = 160 \text{ A/s}$ Now, the self inductance L of the coil is given by,

$$L = \frac{v}{\frac{dI}{dt}} = \frac{115}{160} = 0.719 \text{ Henry}$$

Is this answer helpful?

Helpful

Unhelpful

Subject: [Physics](#), [Science](#)**436,421 students got unstuck** by Course Hero in the last week**Our Expert Tutors** Ask Expert Tutors Answers in as fast as 15 minutes solutions to help you excel in your courses

Stuck? We have tutors online 24/7 who can help you get unstuck.