

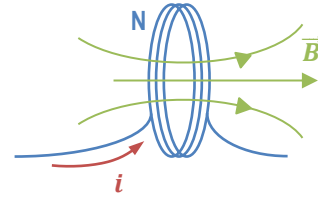
CONCEPT: SELF INDUCTANCE

- A current-carrying wire can induce an EMF _____ through changes in magnetic flux!

- Φ_{Total} depends on N and magnetic field $\vec{B}$, which depends on _____.

- Φ_B is _____ to i .

→ _____



- L is a proportionality constant called the SELF INDUCTANCE

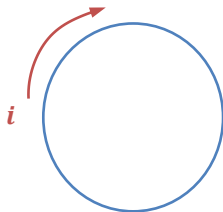
$$L = \text{_____} \rightarrow \text{UNITS: Henry [H]} \rightarrow 1 \text{ H} = 1 \text{ _____} / \text{_____}$$

- depends *only* on the # of turns and the shape of the coil! (i cancels out)

- We can write the self-induced EMF using Faraday's Law OR in terms of the self-inductance L :

$$\mathcal{E} = -N \frac{\Delta \Phi_B}{\Delta t} = \text{_____}$$

EXAMPLE: What is the expression for the self-inductance of a single current-carrying loop of wire with radius r ?



PRACTICE: SELF-INDUCTING COIL OF WIRE

A single loop of wire with a current of 0.3A produces a flux of 0.005 Wb. If the self-induced EMF on this loop is 10 mV, how quickly must the current be changing?

EXAMPLE: SELF-INDUCTANCE OF A TOROIDAL SOLENOID

A toroidal solenoid has 500 turns, cross-sectional area of 6.25cm^2 , and mean radius of 4cm. **a)** What is the self-inductance of this toroidal solenoid? **b)** If the current decreases constantly from 5A to 2A in 6ms, what is the induced EMF in the coil?