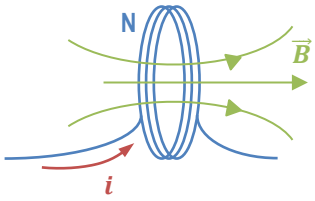
CONCEPT: SELF INDUCTANCE

● 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

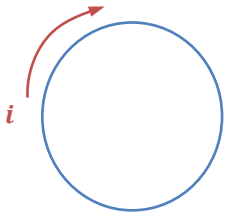
L = _____ → UNITS: Henry [**H**] → 1 H = 1 ____ / ____

- 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:

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

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?