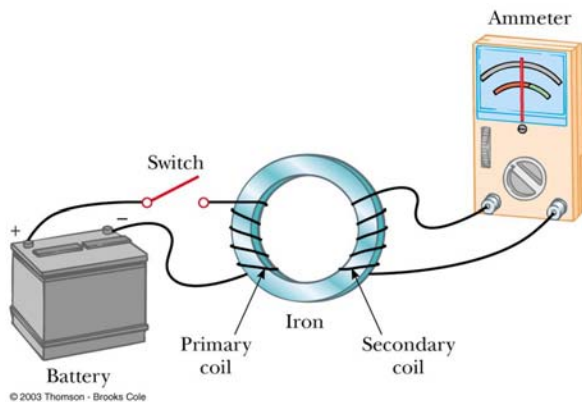


Chapter 20

Induced Voltages and Inductance

Faraday's Experiment discovered that a changing magnetic field induces an electric current in a circuit.

When the switch is closed in the circuit of the primary coil, a current is induced in the secondary coil, but it doesn't last. When the switch is opened the current is induced again, but in the opposite direction it then dies down. (The primary current causes a magnetic field which induces the current in the secondary coil.) The iron coil is a magnetic material.



Flux Φ is the amount of magnetic field lines per area. $\Phi = BA \cos \theta$

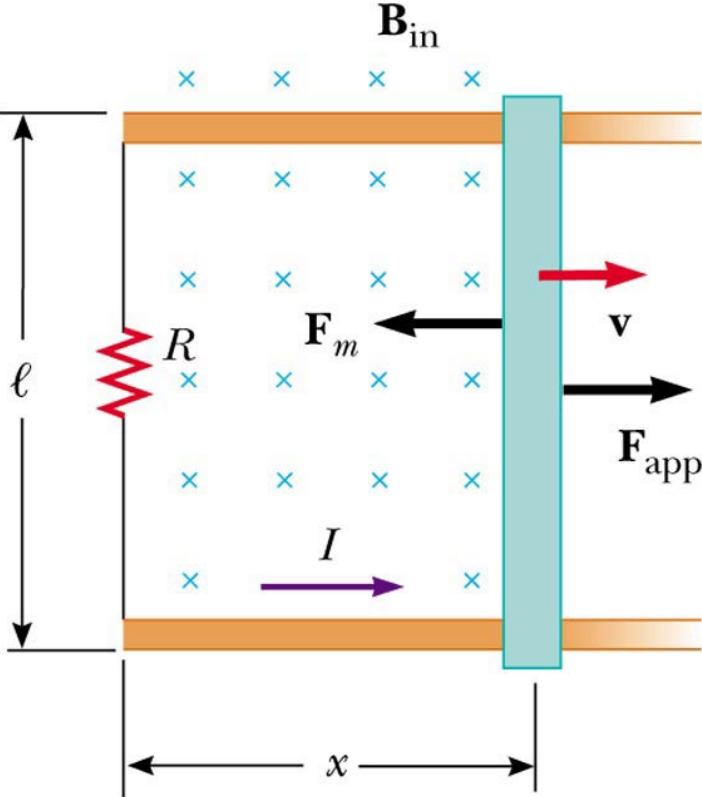
B measured in Tesla, A is area and measured in m^2 , therefore Φ is in Tm^2

Induced voltage is called an "electromotive force", emf or the symbol ε .

$\varepsilon = -N (\Phi/t)$ where N is #loops, Φ is flux in Tm^2 , and t is time in seconds.

The overall unit of ε is volts. So we can also say that if $V=IR$, then $\varepsilon=IR$

$\varepsilon=BLv$ B is magnetic field in Tesla, L is length in m, and v is velocity in m/s. Final units for ε is volts.



(a)