Faraday's Laws of EMI and Lenz's Law

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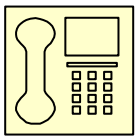

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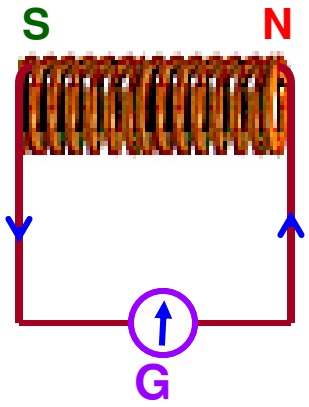
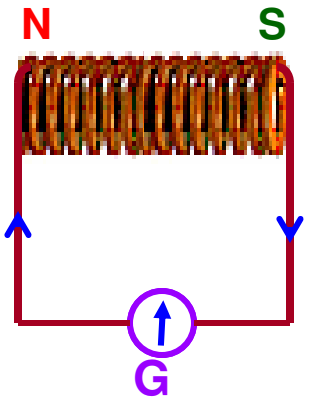
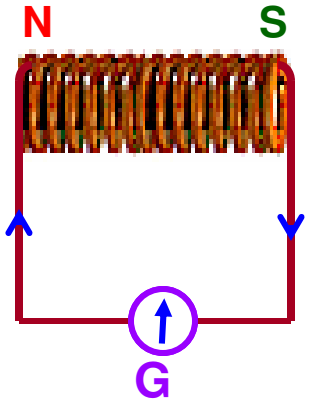
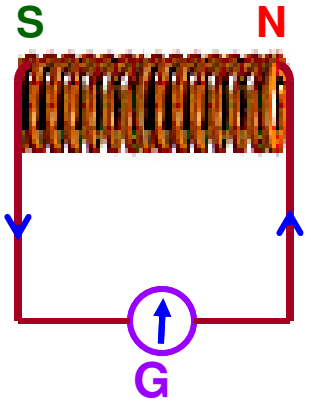
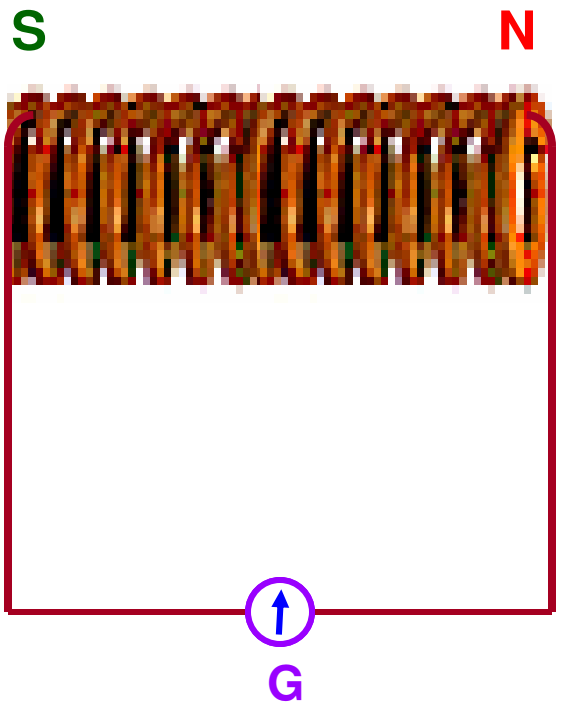
Faraday's Experiment - 1:

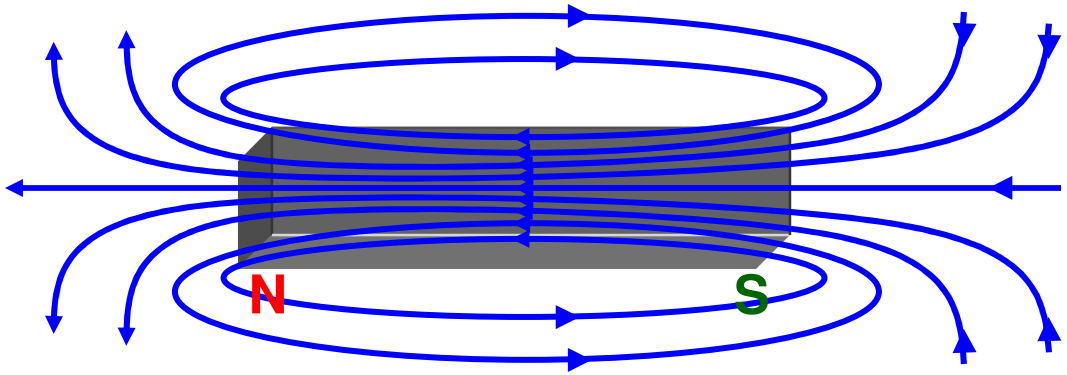






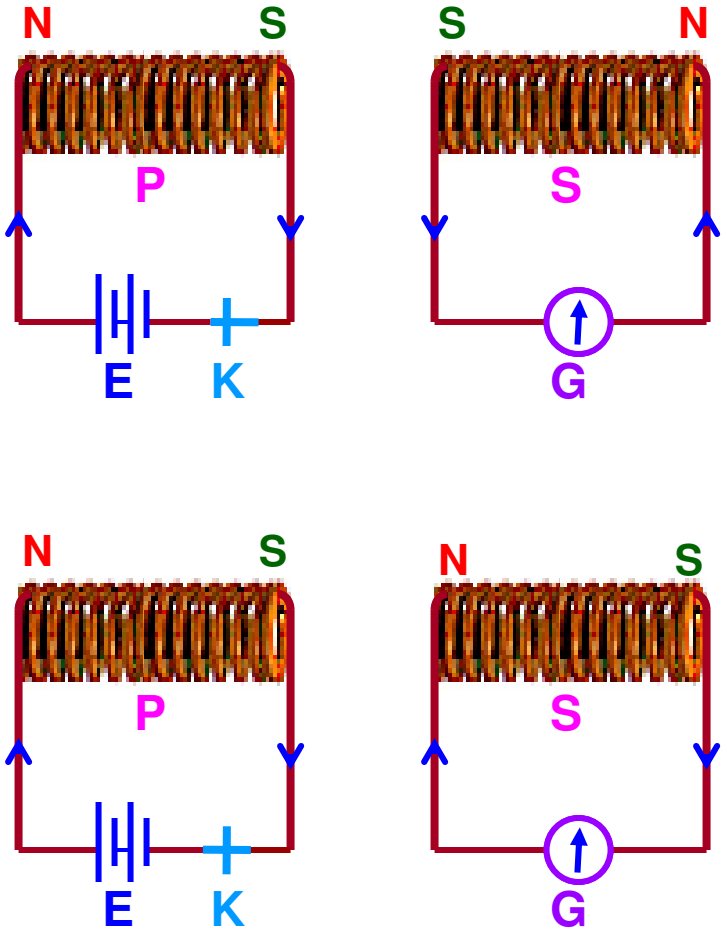






Magnetic flux linked with the coil changes relative to the positions of the coil and the magnet due to the magnetic lines of force cutting at different angles at the same cross sectional area of the coil.

Faraday's Experiment - 2:



Faraday's Laws of Electromagnetic Induction:

I Law: Whenever there is a change in the magnetic flux linked with a circuit, an emf and hence a current is induced in the circuit. However, it lasts only so long as the magnetic flux is changing.

II Law: The magnitude of the induced emf is directly proportional to the rate of change of magnetic flux linked with a circuit.

$$E \propto d\Phi / dt \Rightarrow E = k\, d\Phi / dt$$

$$\Rightarrow E = d\Phi / dt \Rightarrow E = (\Phi_2 - \Phi_1) / t$$

(where k is a constant and units are chosen such that k = 1)

Lenz's Law:

The direction of the induced emf or induced current is such that it opposes the change that is producing it.

i.e. If the current is induced due to motion of the magnet, then the induced current in the coil sets itself to stop the motion of the magnet.

If the current is induced due to change in current in the primary coil, then induced current is such that it tends to stop the change.