Faraday's law: B.Sc. Part-2 Hons.

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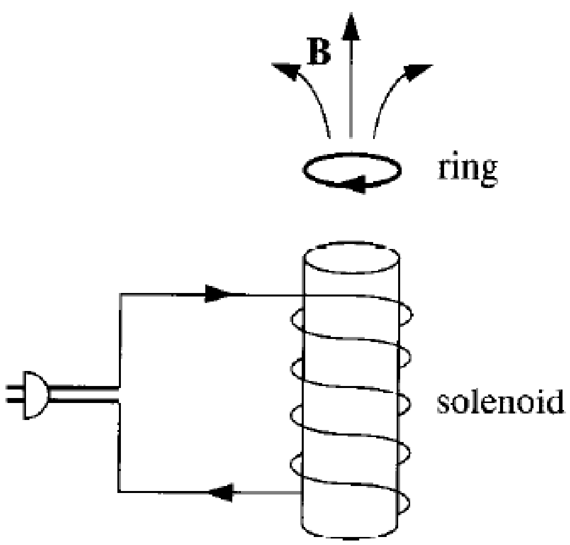
Faraday’s Law:

Faraday’s law is the magnitude of induced emf in a circuit is equal to the time rate of change of magnetic flux. Faraday's law can be well understood by Lenz's law.

According to Lenz’s law:

"If a current flows, it will in such a direction that the magnetic field it produces tends to counteract the change in flux that induced the emf". If the flux is decreasing, the current will flow so that its field adds to the original flux and if increases then current will flow in opposite way and flux will change in that way only.



We know

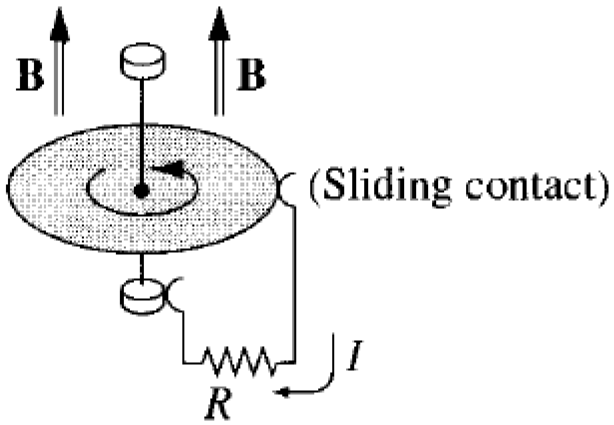
$$\mathcal{E} = \oint \mathbf{E} \cdot d\mathbf{l} = -\frac{d\Phi}{dt},$$

then **E** is related to the change in **B** by the equation

$$\oint \mathbf{E} \cdot d\mathbf{l} = -\int \frac{\partial \mathbf{B}}{\partial t} \cdot d\mathbf{a}.$$

Here we have used Stokes theorem.

$$\boxed{\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}.}$$



We may understand it by an example.A metal disc rotates about a vertical axis, through a uniform field as shown below. A circuit is made by connecting one end of a resistor to the axle and the other end to a sliding contact which touches the outer edge of the disc. Current will flow in the direction indicated, yet the flux through the circuit does not seem to be changing.