

ELECTROMAGNETIC INDUCTION MINDMAPS...

Faraday's Law and Lenz's Law:-

Faraday's Law

→ Whenever the magnetic flux changes an emf is induced in the circuit.

$$e = -\frac{d\phi}{dt} \quad \text{For coil having } N \text{ turns}$$

$$I = -\frac{N}{R} \frac{d\phi}{dt} \quad \text{and} \quad \Delta q = \frac{N \Delta \phi}{R}$$

ϕ : Flux through single coil.

Δq : Charge flow in time Δt .

→ flux can be changed by changing magnetic field, area or angle.

Lenz's Law

→ Induced emf opposes cause of generation

Motional EMF

→ A Moving Wire:-

$$e = Bvl$$

→ Rotating Metallic Rod:-

$$e = \frac{1}{2} B l^2 \omega$$

$$= \pi f B l^2$$

Self Inductance

$$\phi \propto i$$

$$\phi = Li$$

$$e = -\frac{d\phi}{dt} = -L \frac{di}{dt}$$

Induced Electric Field:-

$$\oint \vec{E} \cdot d\vec{l} = -\frac{d\phi_B}{dt}$$

Inductance

→ L for Solenoid:- $L = \frac{\mu_0 N^2 A}{l}$

Mutual Inductance

$$\phi_{21} = M_{21} i_1$$

$$e_2 = -M_{21} \frac{di_1}{dt}$$



$$M_{21} = M_{12}$$

Theorem of reciprocity.

→ For two coils:-

$$L_{eq} = L_1 + L_2$$

→ For two solenoids:-

$$M = \frac{\mu_0 N_1 N_2 A}{l}$$

$$\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2}$$

LR Circuit

→ Growth Of Current:-

$$i = i_0 (1 - e^{-tR/L})$$

→ Decay Of Current

$$i = i_0 e^{-tR/L}$$

$$\text{Energy stored} = \frac{1}{2} Li^2$$



NEET
SLAYER