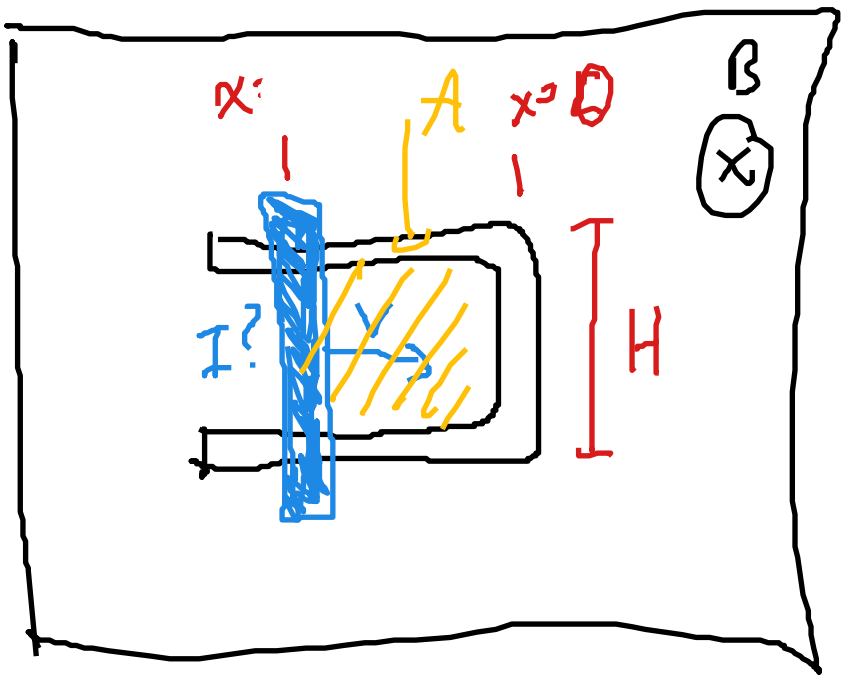
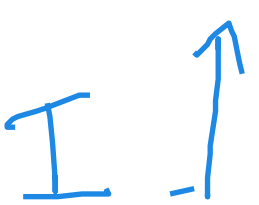


$$\Phi = \vec{B} \cdot \vec{A}_{overlap}$$

Lenz's Law



1) Φ_0 : ⊗ into

2) Δ : decreasing

3) Φ_{ind} : ⊗

4) I_{ind} : ↺

Faraday's Law

$$\mathcal{E}_{ind} = \frac{d\Phi}{dt}$$

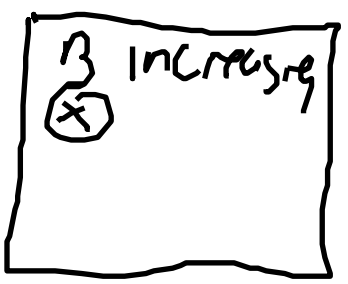
$$= \frac{d}{dt}[B H x]$$

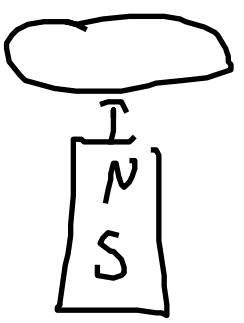
$$= BH\frac{dx}{dt}$$

$$= BHv$$

$$I_{ind} = \frac{\mathcal{E}_{ind}}{R} = \frac{BHv}{R}$$

How flux can change

- B can change
  - 

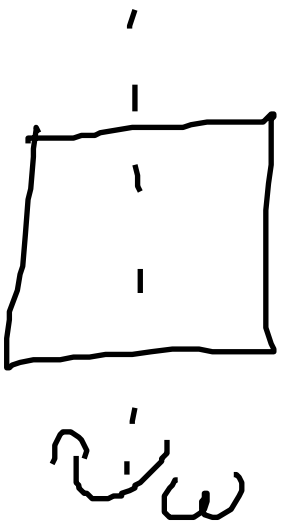
$B(t) = 5t$
  - 

- A can change
  - area of loop shrinks/expands
  - loop moves into or out of field
- θ can change
  - field rotates
  - loop rotates

Constant Uniform Fcld $\vec{B}$

loop with area $\vec{A}$

turns at constant rate $\omega = 0.1 \frac{rad}{s}$



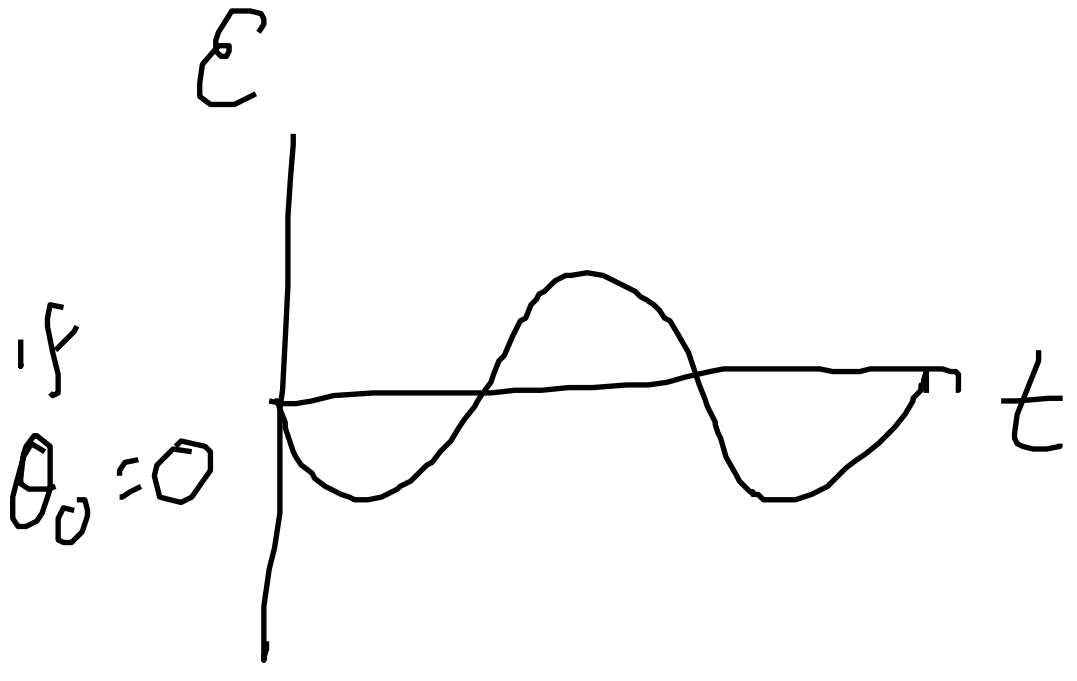
$$\omega = \frac{d\theta}{dt}$$

$$\theta = \omega t + \theta_0$$

$$\Phi_B = \vec{B} \cdot \vec{A} = BA\cos\theta$$

$$= BA\cos(\omega t + \theta_0)$$

$$\mathcal{E}_{ind} = \frac{d\Phi_B}{dt} = -BA\omega\sin(\omega t + \theta_0)$$



Alternating Current (AC)

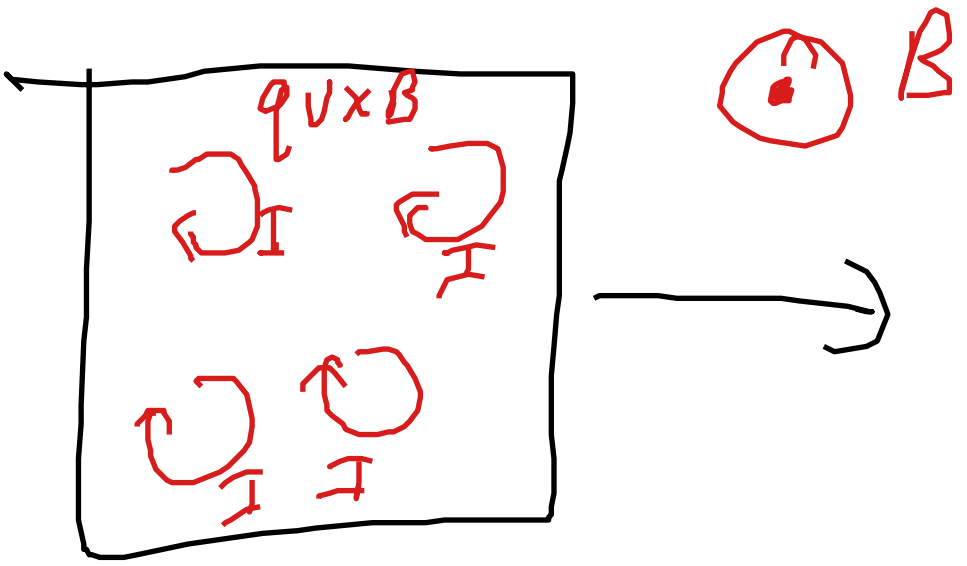
Generator

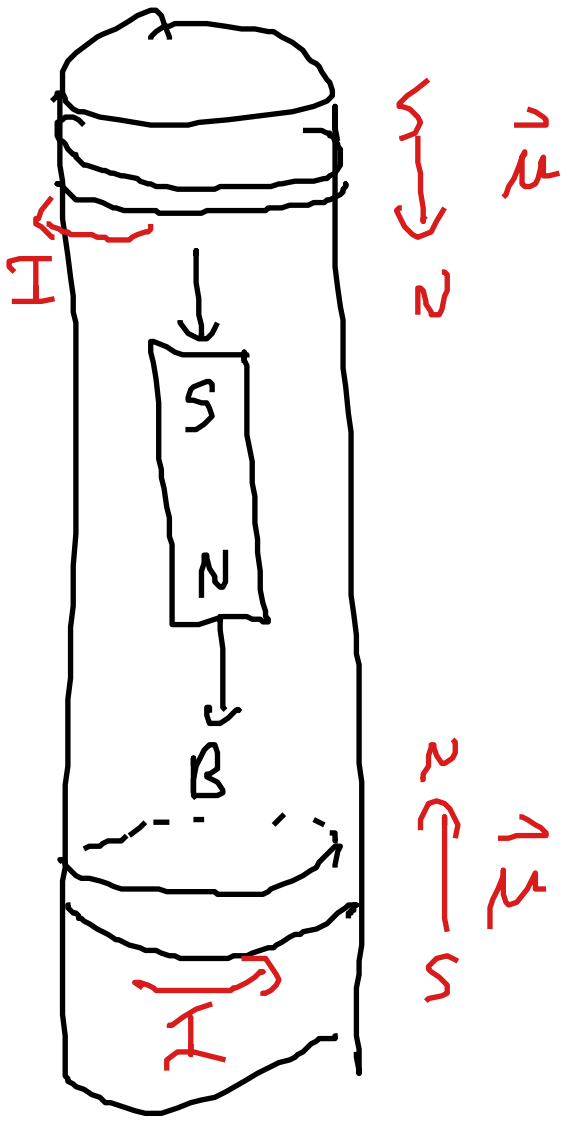
converts mechanical energy

to electrical energy

Eddy Currents

If a metal plate moves through a magnetic field, current loops will be created in the metal




I
S
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B
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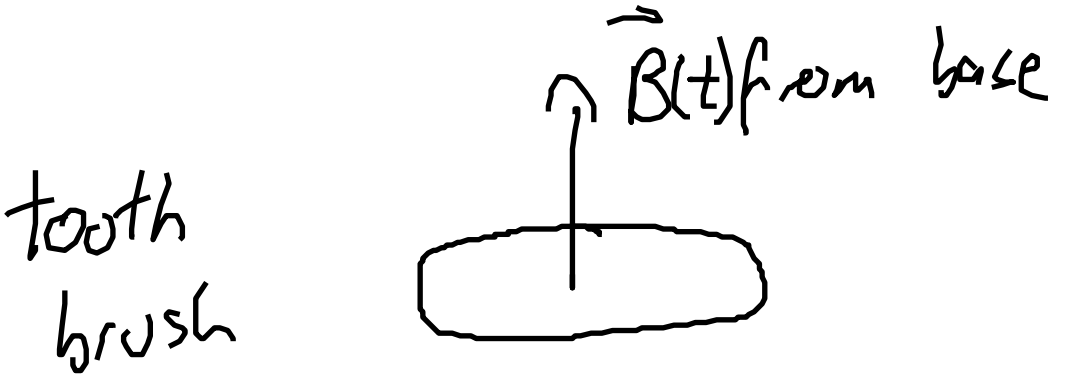
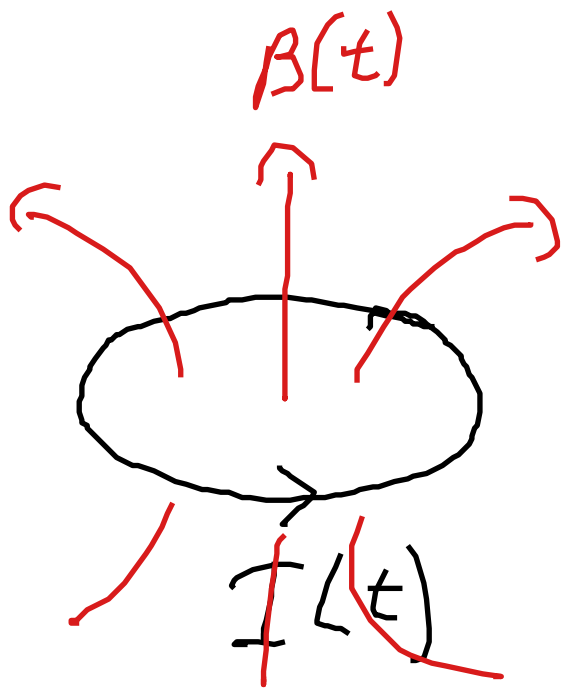
Contactless Charging



If current in base alternates then B it creates also changes & Φ_B seen by toothbrush also alternates → induced current

Self- Induction



Current loop creates a magnetic field which passes through itself.

If I(t) changes, there will be some inertia.