

Electromagnetic Induction

Physics

Faraday's and Lenz's laws, and what the minus sign means.

The induced EMF equals the negative rate of change of magnetic flux linkage.

$$\varepsilon = -N \frac{d\Phi}{dt} \cdot \Phi = BA \cos \theta$$

Faster change

Larger EMF

More turns

Larger EMF

Flux linkage $N\Phi$.

Lenz's law

Induced current opposes the change

The minus sign.

THE COMMON MISTAKE

✗ **Reading Lenz's law as a rule about direction only**

✓ **It is energy conservation**

If the induced current reinforced the change, it would accelerate itself and create energy from nothing.

A magnet dropped through a copper tube falls slowly: induced eddy currents oppose its motion. That is Lenz's law visible.