Summary of Lenz' law

$$\boxed{\text{Induced EMF } \varepsilon \text{ \underline{\textit{opposes change}} in flux } \Phi}$$

1. Is Φ *increasing*, *decreasing*, or *constant*?

2. If Φ increases:
   ε induces *B* field *opposite* external *B* field

Top view   Side view
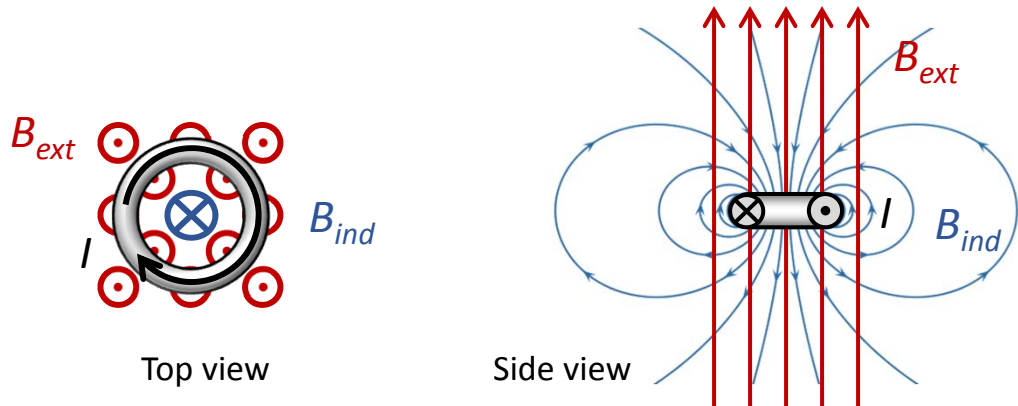
If Φ decreases:
ε induces *B* field *along* external *B* field

Top view   Side view
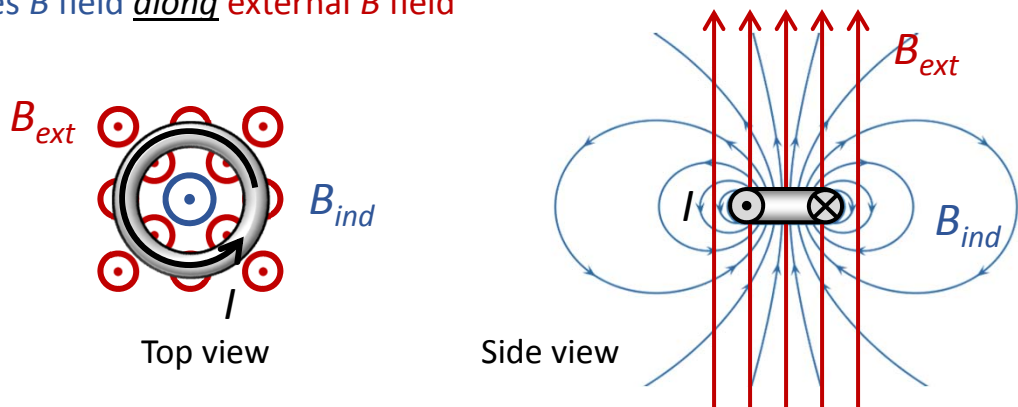
If Φ is constant:
ε is zero, no induced *B* field

3. Type II RHR gives current direction

   Curl fingers along *I*
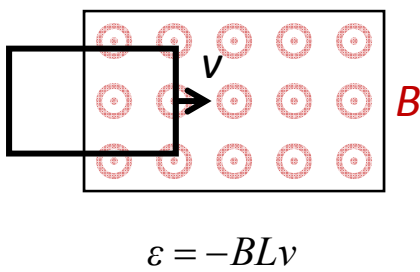   Thumb along B_{ind}
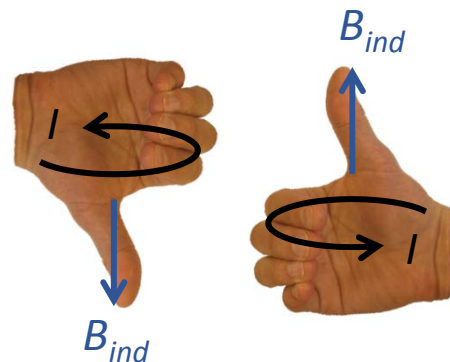
Summary of Faraday's law

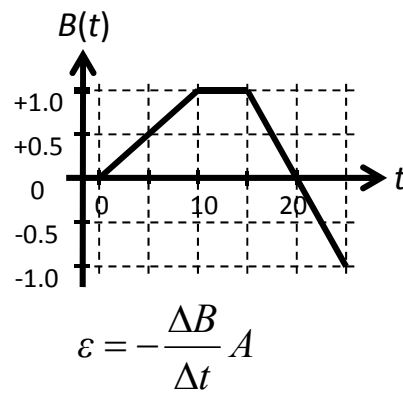Faraday's law: "Induced EMF" = rate of change of magnetic flux

$$\varepsilon = -\frac{\Delta\Phi}{\Delta t}$$

Since $\Phi = BA\cos\varphi$, 3 things can change Φ

1. Area of loop

$$\varepsilon = -BLv$$

2. Magnetic field B

$B(t)$

$$\varepsilon = -\frac{\Delta B}{\Delta t}A$$

3. Angle φ

$$\varepsilon(t) = \omega NBA\sin\omega t$$