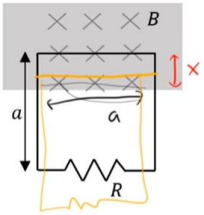
a)



ggl induksi

Hkm Faraday

$$\varepsilon_{ind} = -N \frac{d\Phi}{dt}$$

fluks magnet

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

$= BA \cos\theta$

$N = 1$

$$\Phi = Bax$$

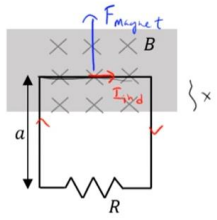
$$\varepsilon_{ind} = \left| \frac{d\Phi}{dt} \right| = Ba \frac{dx}{dt}$$

$$\varepsilon_{ind} = \left| \frac{d\Phi}{dt} \right| = Ba \frac{dx}{dt} \quad , \quad \frac{dx}{dt} = v$$

$$\varepsilon_{ind} = Bav$$

$$I_{ind} = \frac{\varepsilon_{ind}}{R} = \frac{Bav}{R} = 5 \cdot 10^{-3} \, A = 5 \, mA$$

b)



$$F_{magnet} = I \ell B \sin\theta$$

$$= I_{ind} a B \sin\theta$$

Hkm Lenz

↓

↓ induksi muncul → melawan perubahan Φ

× berkurang

Φ berkurang

$\theta = 90°$

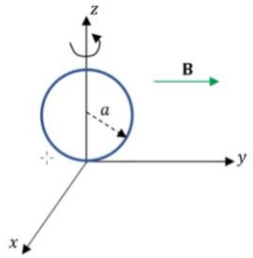
$$F_{magnet} = I_{ind} a B = 2,5 \cdot 10^{-4} \, N$$

c) $P = I^2 R$ (daya disipasi)

$$P = I_{ind}^2 R = 2,5 \cdot 10^{-3} \, W$$

$$= 2,5 \, mW$$

2.



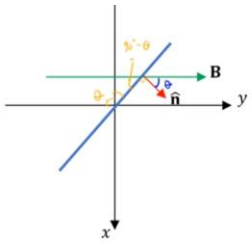
Hkm Faraday

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

$N = 1$

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

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



$$A = \pi a^2$$

$$B = B_0$$

$$\theta = \alpha + 2\beta t$$

$$\Phi = BA\cos(\alpha + 2\beta t)$$

$$\Phi = B_0 \pi a^2 \cos(\alpha + 2\beta t)$$

$$\mathcal{E}_{ind} = \left| \frac{d\Phi}{dt} \right| = B_0 \pi a^2 \left| \frac{d}{dt} \cos(\alpha + 2\beta t) \right|$$

$$\mathcal{E}_{ind} = 2\pi\beta B_0 a^2 \sin(\alpha + 2\beta t)$$

max saat $\sin(\dots) = 1$

$$\mathcal{E}_{max} = 2\pi\beta B_0 a^2$$

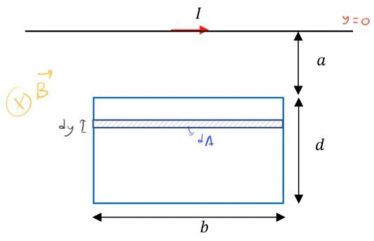
$$I_{ind} = \frac{\mathcal{E}_{ind}}{R}$$

$$I_{max} = \frac{\mathcal{E}_{max}}{R} = \frac{2\pi\beta B_0 a^2}{R}$$

3.

a) $\Phi = \vec{B} \cdot \vec{A} = BA\cos\theta$ (B homogen)

$\Phi = \int \vec{B} \cdot d\vec{A}$



$B = \frac{\mu_0 I}{2\pi y}$

$dA = b\,dy$

$\vec{B} \cdot d\vec{A} = B\,dA$

$\Phi = \int B\,dA = \int \frac{\mu_0 I}{2\pi y} b\,dy = \frac{\mu_0 I b}{2\pi} \int_a^{a+d} \frac{dy}{y} \rightarrow \ln$

$\Phi = \frac{\mu_0 I b}{2\pi} \ln\left(\frac{a+d}{a}\right) = \frac{\mu_0 I b}{2\pi} \ln\left(1 + \frac{d}{a}\right)$

$\ln(a+d) - \ln a$

$\Phi = 1{,}83 \cdot 10^{-8}$ Wb

b) ggl induksi $\quad \varepsilon_{ind} = \left| -N \frac{d\Phi}{dt} \right| = \left| -\frac{d\Phi}{dt} \right|$

$a^{-1} \rightarrow -a^{-2}$

$\varepsilon_{ind} = \frac{\mu_0 I b}{2\pi} \frac{d}{dt}\left\{\ln\left(1 + \frac{d}{a}\right)\right\} \quad \frac{d}{a} \rightarrow -\frac{d}{a^2}$

$= \frac{\mu_0 I b}{2\pi} \left| \frac{1}{1 + d/a} \cdot -\frac{d}{a^2} \cdot \frac{da}{dt} \right|$

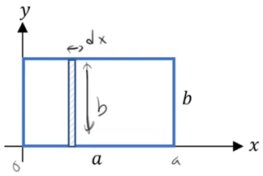
$\varepsilon_{ind} = \frac{\mu_0 I b}{2\pi} \frac{d}{(1+d/a)a^2} V = 1{,}2 \cdot 10^{-7}$ V

c) $I = 2 + t/4 \qquad \varepsilon_{ind} = \left| \frac{d\Phi}{dt} \right| \qquad \frac{dI}{dt} = \frac{1}{4}$

$\varepsilon_{ind} = \frac{\mu_0 \frac{dI}{dt} b}{2\pi} \ln\left(1 + \frac{d}{a}\right) = 4{,}58 \cdot 10^{-9}$ V

4.

$\Phi = \vec{B} \cdot \vec{A} \longrightarrow \Phi = \int \vec{B} \cdot d\vec{A}$



$dA = b\,dx$

$\Phi = \int B\, b\, dx$

$= \int_0^a kxt^2\, b\, dx$

$\Phi = kbt^2 \int_0^a x\, dx = kbt^2 \left[\frac{1}{2}x^2\right]_0^a$

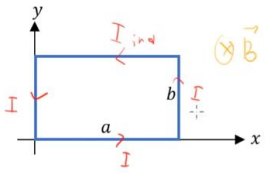
$\Phi = \frac{1}{2} kbt^2 a^2$

Hkm Faraday → $\varepsilon_{ind} = \left| -N \frac{d\Phi}{dt} \right| = \left| -\frac{d\Phi}{dt} \right|$

$\varepsilon_{ind} = \frac{1}{2} kba^2 \frac{d}{dt}(t^2) = \frac{1}{2} kba^2\, 2t$

$\varepsilon_{ind} = kba^2 t$ //

$I_{ind} = \frac{kba^2 t}{R}$ //



$B \propto t^2$

makin lama ⊗

B makin gede

Hkm Lenz

dilawan : harus ada B lain ⊙