Medan Magnet

medan magnet bekerja pada sebuah titik yang simbolnya B satuan T(tesla) atau $Wb \times m^{-2}$

Medan magnet pada kawat lurus

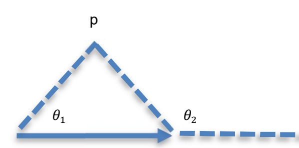
1. Kawat lurus panjang tak hingga

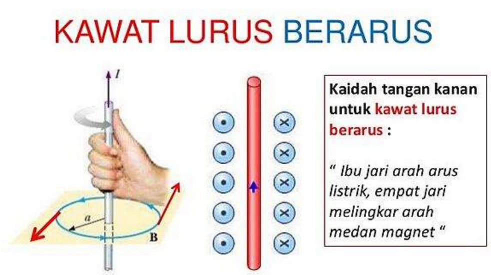
$$B = \frac{\mu_0 I}{2\pi a} \times \mu_r$$

$\boldsymbol{I} = Kuat\ Arus\ (A)$
$\boldsymbol{\mu_0} = 4\pi \times 10^{-7}$
$\boldsymbol{a} = jarak\ titik\ ke\ kawat\ (m)$
$\boldsymbol{B} = induksi\ magnetik\ (Tesla)(Wb \times m^{-2})$
$\boldsymbol{\mu_r} = permitivitas\ bahan(jenis\ kawat)$

2. Kawat lurus panjang tertentu

$$B = \frac{\mu_0 I}{4\pi a}\mu_r(\cos\theta_1 - \cos\theta_2)$$



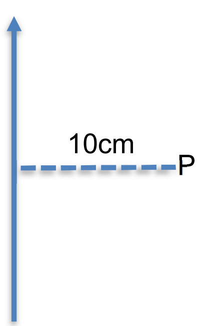


Kanan kawat = masuk bidang 

Kiri kawat = keluar bidang 

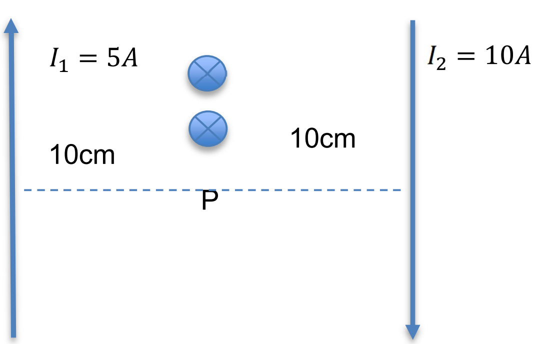
contoh:

1.



$$B = \frac{\mu_o I}{2\pi a} = \frac{4\pi \times 10^{-7} \times 5}{2\pi \times 10^{-1}}$$
$$B = 10^{-5}\ Wb \times m^{-2}$$

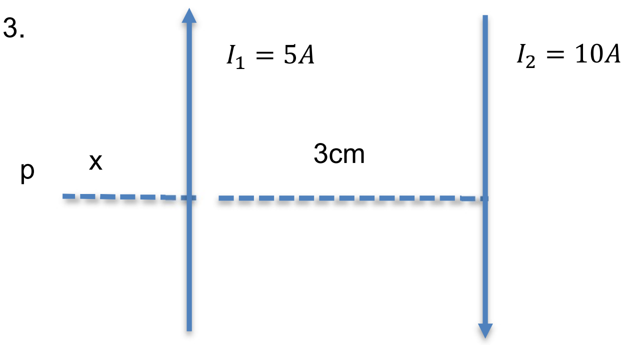
2.



Ket :
Berlaku resultan
Jika tandanya sama maka di tambah, jika beda di kurang

$$B_P = B_1 + B_2$$
$$B_1 = \frac{4\pi \times 10^{-7} \times 5}{2\pi \times 10} = 10^{-5}\ T$$
$$B_2 = \frac{4\pi \times 10^{-7} \times 10}{2\pi \times 10} = 2 \times 10^{-5} T$$
$$B_p = 10^{-5} + 2 \times 10^{-5}$$
$$B_p = 3 \times 10^{-5}$$

3.



Dimana letak titik p agar Bp = 0

Ket :
Arus beda arah
"P diluar dekat arus yang kecil"

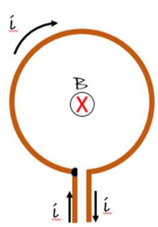
Arus searah
"P diantara arus"

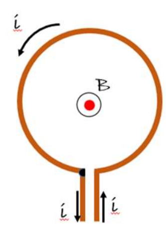
$B_p = 0$
$B_1 - B_2 = 0$
$B_1 = B_2$
$\frac{\mu_o I_2}{2\pi a} = \frac{\mu_o I_2}{2\pi a}$
$\frac{5}{x} = \frac{10}{3+x}$
$3 + x = 2x$
$x = 3cm$ -> dari kiri kawat 1

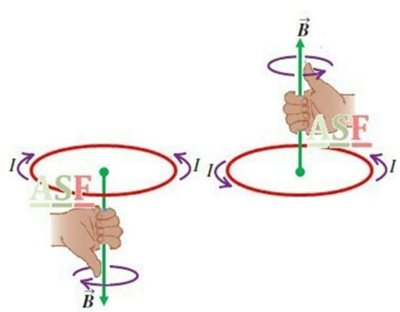
Medan Magnet pada kawat melingkar

<u>Pusat</u>

$B = \frac{\mu_o I}{2R} \times \mu_r$

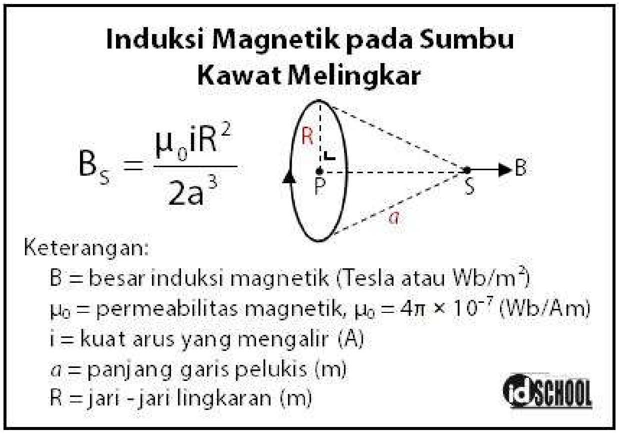




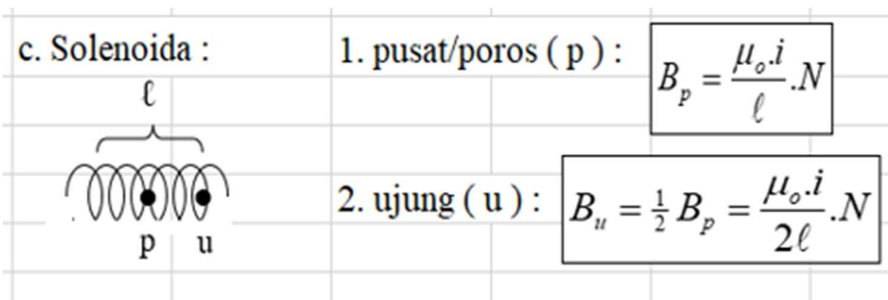


Empat jari = Arus
Jempol = B

Sumbu Ujung

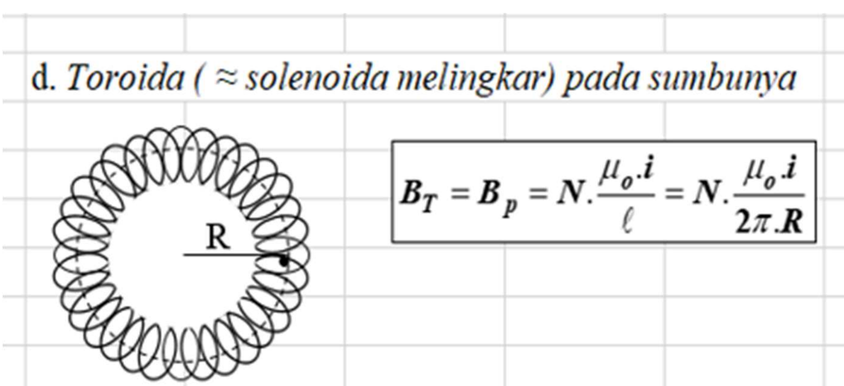


Solenoida



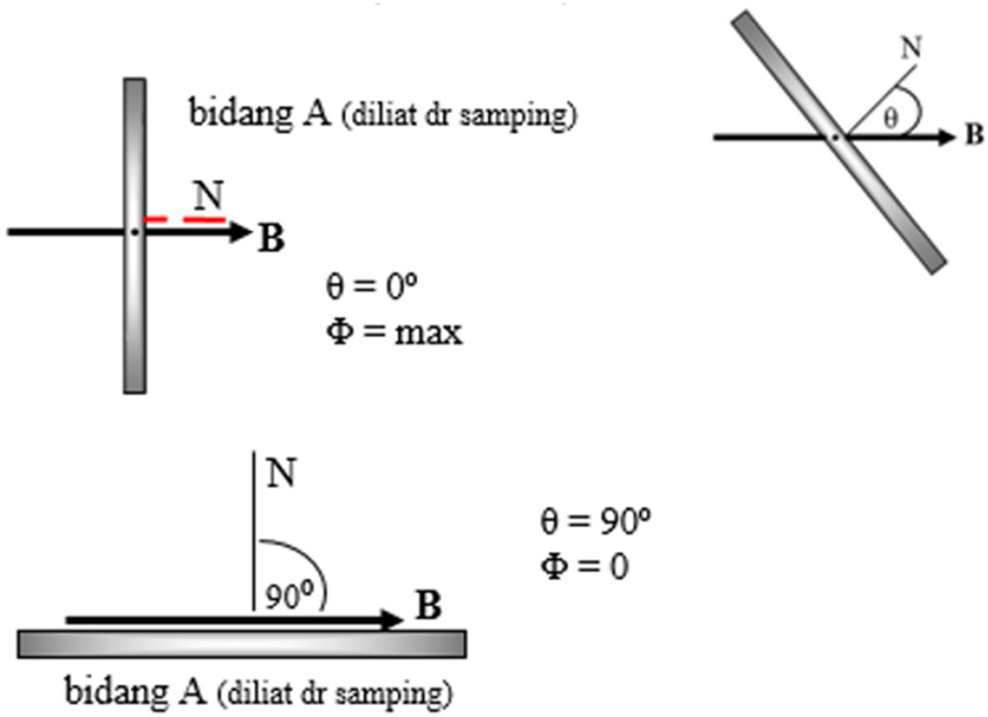
N = jumlah lilitan
L = Panjang selonoida

Toroida



Fluksmagnet ϕ

$\phi = B\ A \cos\theta$

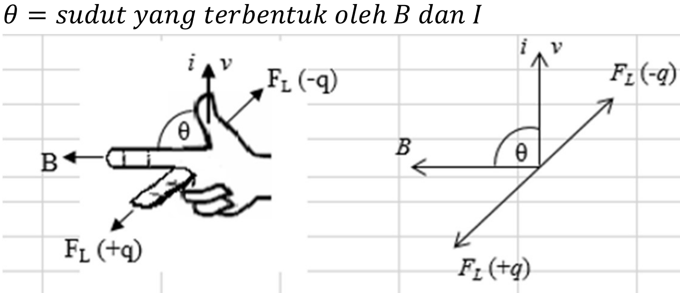


Gaya Lorenz

Satu kawat lurus

$F = B\ I\ l \sin\theta$

$\theta = sudut\ yang\ terbentuk\ oleh\ B\ dan\ I$



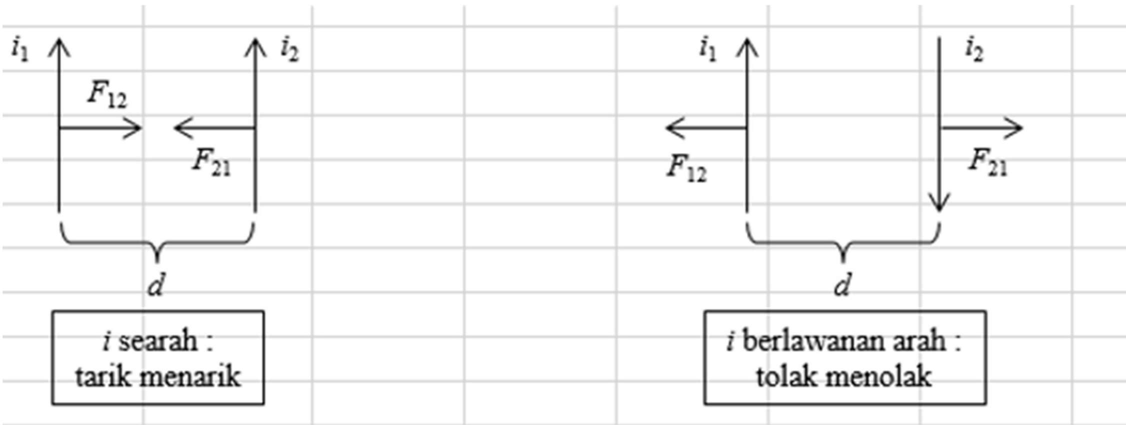
$F = B\ q\ v \sin\theta$

$\theta = sudut\ yang\ terbetuk\ oleh\ B\ dan\ q$

2 kawat sejajar

$F = \frac{\mu_0 \times I_1 \times I_2}{2\pi a} \times \mu_r \times l$

a = jarak antar kawat



Jari jari electron

$R = \frac{m \times v}{B \times q}$

$m_e = 9 \times 10^{-31} kg$

$q_e = 1{,}6 \times 10^{-19} C$

$v = kecepatan\ elektron$

Induksi Elektromagnetik (GGI)

$\varepsilon = I \times R$

$\varepsilon = B \times l \times v \times \sin\theta$

$\varepsilon = B \times l \times v \times N$

$\varepsilon = -N \frac{\Delta\phi}{\Delta t} = -N \frac{\Delta B \times A \times \cos\theta}{\Delta t}$

$\varepsilon = -L \frac{\Delta I}{\Delta t}$

$\varepsilon = BAN\omega \sin\theta$

$\varepsilon = BAN\omega \sin(\omega \times t)$

$\varepsilon = -M \frac{\Delta I}{\Delta t}$

$\omega = 2\pi f = \frac{2\pi}{T}$

$L = \frac{\mu_0 \times N^2 \times A \times \mu_r}{l}$

$L = \frac{N\phi}{I} = \frac{NBA\cos\theta}{I}$

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

$W = \frac{1}{2} \times L \times I^2 = P \times t$

$I = arus\ induksi\ elektro\ magnetik\ (A)$

$R = Hambatan$

$B = medan\ magnet (selonoida, toroida)(T)$

$\phi = fluks\ (BA\cos\theta)$

$\varepsilon = GGL\ (v)$

$L = induktansi\ diri\ (H)$

$N = jumlah\ lilitan$

$l = panjang (m)$

$\omega = kecepatan\ sudut\ (rad \times s^{-1})$

$f = frekuensi\ (Hz)$

$T = Periode\ (s)$

$M = Induktansi\ silang\ (H)$

$W = energi\ listrik$

Tranformator (Trafo)

5). Trafo : $\boxed{\dfrac{N_p}{N_s} = \dfrac{V_p}{V_s}}$

$$\boxed{\eta = \frac{P_s}{P_p}}$$

Sekunder = keluaran / alat
Primer = sumber tegangan