25-03-24

Hukum Gauss dan Aplikasi

$$\oint_S \bar{E} \cdot d\bar{a} = \int_V (\nabla \cdot \bar{E}) \, d\tau$$

$$\oint E \cdot dq = \oint \frac{q}{4\pi \varepsilon_0 r^2} r^2 \sin\theta \, d\theta \, d\phi$$

$$= \frac{q}{4\pi\varepsilon_0} \int_0^{\pi} \int_0^{2\pi} \sin\theta \, d\theta \, d\phi$$

$$= \frac{4\pi q}{4\pi\varepsilon_0}$$

$$\oint_S \bar{E} \cdot dq = \frac{q}{\varepsilon_0}$$ Persamaan Gauss dalam bentuk differensial

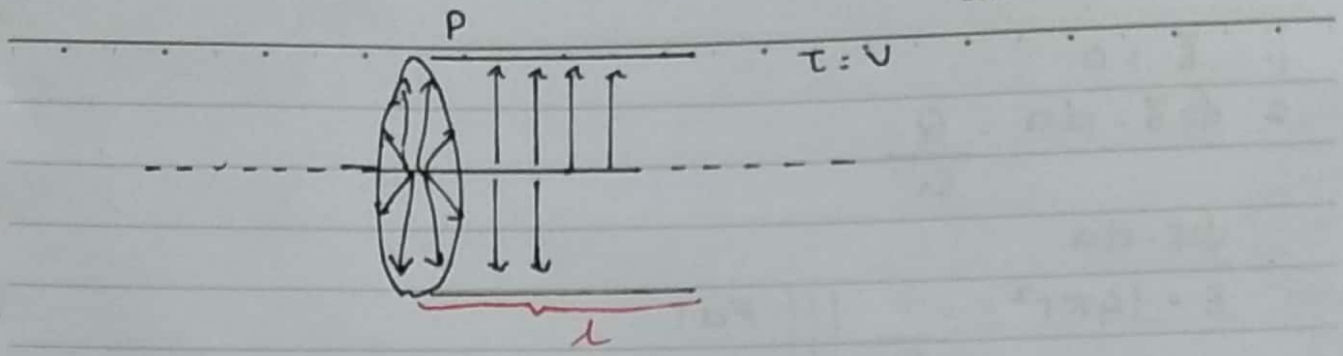
$$\int_V (\nabla \cdot \bar{E}) \cdot d\tau$$

$$Q = P d\tau$$

$$\int (\nabla \cdot \bar{E}) \, d\tau = \frac{Q}{\varepsilon_0}$$ → asalnya dr $\oint \bar{E} \cdot d\bar{a} = \int (\nabla \cdot E) \, d\tau$

$$= \frac{1}{\varepsilon_0} \int_V P d\tau$$

$$\nabla \cdot \bar{E} = \frac{P}{\varepsilon_0}$$ Hk. gauss dalam bentuk differensial



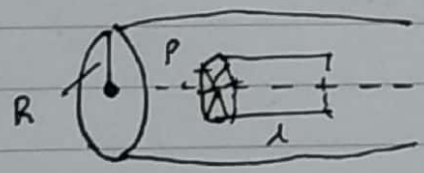
$\oint \bar{E} \cdot da = \frac{q}{E_0}$

λ = rapat muatan pada kawat

$\bar{E} \cdot (2\pi z \cdot l) = \frac{\lambda \cdot l}{E_0}$

$\bar{E} = \frac{\lambda}{2\pi E_0 z} \hat{z}_0$

latihan : no 2. hal 61



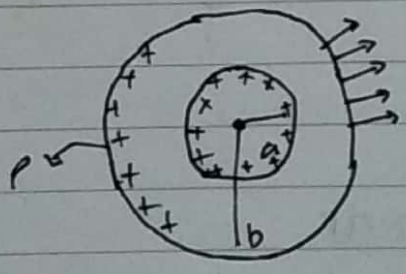
$\oint \bar{E} da = \frac{q}{E_0}$

menggunakan r kecil krna yg dihitung medan magnet brrti didalam

$\bar{E} (2\pi r \cdot l) = \frac{Q}{E_0}$

$\bar{E} = \frac{Q}{2\pi E_0 r l} \hat{r}_0$

1).



Calculate of $\bar{E}$.

1. $r < a$
2. $a < r < b$
3. $r > b$.

1. $\vec{E} = 0$

2. $\oint \vec{E} \cdot da = \frac{Q}{\varepsilon_0}$

$\oint E \cdot da$

$E \cdot (4\pi r^2) = \frac{1}{\varepsilon_0} \iiint \rho \, d\tau$

$= \frac{1}{\varepsilon_0} \int_0^a \int_0^{2\pi} \int_0^{\pi} \rho \, r^2 \sin\theta \, d\theta \, d\phi \, dr$

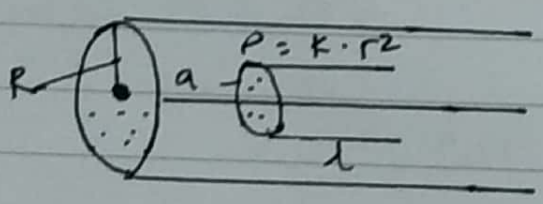
$= \frac{4\pi\rho}{\varepsilon_0} \int_0^a r^2 \, dr \quad \frac{4\pi\rho}{\varepsilon_0} \left(\frac{1}{3} r^3 \Big|_0^a \right)$

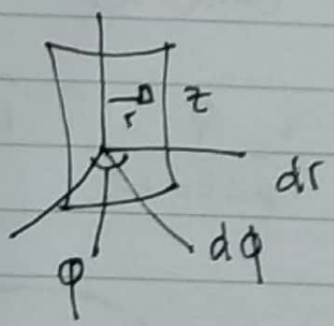
3. $\oint \vec{E} \cdot da = \frac{1}{\varepsilon_0} \iiint \rho \, d\tau$

$= \frac{1}{\varepsilon_0} \iiint \rho \, r^2 \sin\theta \, d\theta \, d\phi \, dr$

$= \frac{4\pi\rho}{\varepsilon_0} \int_a^b r^2 \, dr$

$= \frac{4\pi\rho}{\varepsilon_0} \left(\frac{1}{3} r^3 \Big|_a^b \right)$





$\oint Ed \cdot a = \frac{1}{\varepsilon_0} \iiint \rho \, d\tau$

$\vec{E}(2\pi r \cdot l) = \frac{1}{\varepsilon_0} \int_0^{2\pi} \int_0^{l} \int_0^{R} (kr^2) \, r \, d\phi \, dz \, dr$

$$= \frac{2\pi K}{E_0} \int_0^L dz \int_0^R r^3 \, dr$$

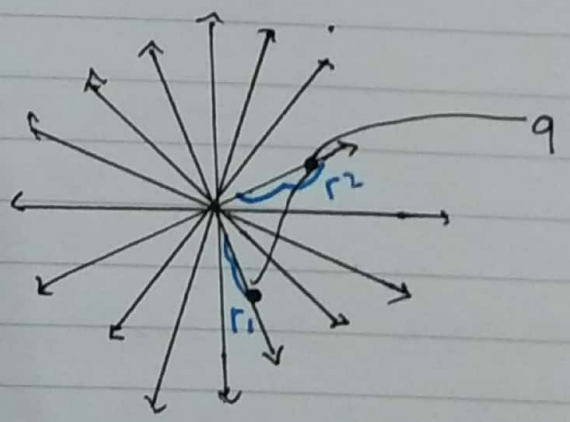
Potensial

- Potensial oleh muatan listrik
- beda Potensial oleh arus listrik
- Potensial listrik (usaha memindahkan muatan dri jauh ke titik tertentu).

$$W = F \cdot S$$

$$V = \frac{W}{q} = \frac{F \cdot S}{q} = k \frac{\frac{q \cdot q}{r} s}{q}$$

$$\boxed{V = k \frac{q}{r}}$$



$$dv = -\oint_{r_1}^{r_2} \bar{E} \, dr$$

$$V_1 - V_2 = -\int \bar{E} \, dr$$

$$\Delta V = -\int_{r_1}^{r_2} \frac{Q}{4\pi E_0 r^2} \, dr$$

JOYKO 30 Lines, 6 mm

$\Delta V \neq dV$

Perbedaan besar — Perbedaan kecil

No Selasa
Date 20 Feb 2024

No
Date

$$= -\frac{q}{4\pi\varepsilon_0} \int_{r_1}^{r_2} r^{-2}\, dr$$

$$= \square \int_{r_1}^{r_2} r^{-2}\, dr$$

$$= \square \left(-\frac{1}{r} \Big|_{r_1}^{r_2} \right)$$

$$= \square \left(\frac{1}{r_2} - \frac{1}{r_1} \right)$$

$$V = \frac{1}{4\pi\varepsilon_0} \frac{q}{r} = k\frac{q}{r}$$